Proceedings

4th International Virtual Conference on "Agricultural & Biological Science Research"

IVCABSR-2021

9-10 January 2021

Organised By

KALP LABORATORY
A CENTRE FOR BASIC & APPLIED SCIENCES

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Mr. Yagyavalkya Sharma

Dr. Abishek Mathur

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INTERNATIONAL BIOTECH TECHNOCRATS & CONSULTANTS ASSOCIATION

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IVCABSR-2021

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Message

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It gives me pleasure to welcome all the experts, academicians, research scholars, delegates, students and all participants **This two Day 4th"International Virtual Conference on"Agricultural & Biological Science Research"on January09th-10th 2021**, with multidisciplinary approach, by kalp Laboratories, Mathura. Environmental problems are being faced everywhere globally. Life is becoming tough for living beings as they are facing environmental threats. Biodiversity across the world has been facing challenges for their existence. They have been assigned status like „endangered", „vulnerable" and „extinct". Anthropological activities and undesirable choices harm them in many ways. At the same time by virtues of researchers different strategies and technologies are coming up for their preservation, conservation and sustainability. To the best of my knowledge, this conference is going to present some of the best ideas and knowledge by academicians. This conference will going to provide a shareable dais for scientists, researchers, academicians, environmentalists and biodiversity conservators from each nook and corner of our nation where they must be going to propagate experimental and practical approved outputs of their doings to each segment of society. Apart from this participants will have fruitful discussions and results and this intellectual practice will benefit them from innovative research ideas of experts of their respective arena. I thank all the participants for bringing out their work and innovative thoughts. I congratulate them for their participation and wish them success in their ventures.

Thanks

Organizing Secretary

(IVCABSR-2021)

Message

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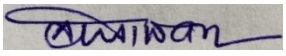
It is my profound privilege and pleasures that KALP laboratories & The BOUQUET Society, in collaboration with Plant Research and Educational Promotion Society is jointly organizing "International Virtual Conference on **"Agricultural & Biological Science Research"**on January 09th-10th 2021. The virtual conference will mainly focus on recent work and future strategies on Human welfare, Agricultural research development. Surely, the early carrier researchers, students will be benefited with the healthy discussion and scientific deliberation of the eminent research workers, learned speaker. On behalf of Plant Research and Educational Promotion Society, I wish my good wishes for the successful organization of IVCABSR-2021.



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Dear Organizers

IVCABSR-2021

My heartfelt wishes to the team of organizing committee of "International Virtual Conference on "Agricultural & Biological Science Research" on January 09th-10th 2021, for organizing such a great platform for presenting their research and innovations. My heartiest best wishes to Mr. Yagyavalkya Sharma, Jr. Scientist cum Training Coordinator, Kalp Laboratories, Mathura, Uttarpradesh and Organizing Secretary of IVCASBR-2021 for keep doing the great work This virtual conference will definitely prove it's worth as one of the premier event for researchers, academicians, educators of field of Biological Sciences, Pharmaceutical Sciences and Agricultural Sciences. Heartiest welcome and congratulations to all Eminent Speakers, Colleagues, dear students/scholars for being the prominent part of this International Virtual Conference. Thank you all the stake holders and contributors who are directly or in directly involved in this venture.Lots of best wishes for the grand success of this event!!Best Regards

Dr. Abhishek Mathur

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Invited Speakers Abstracts

Separation and Identification of Anthocyanins Extracted From Popular Himalayan Bayberry: *Myrica Esculenta* Using HRLC-MS Analytical Technique

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ABSTRACT

Myrica esculenta a popular wild edible fruit of the Indian Himalayan Region (IHR). Since ancient times it is used as herbal medicine to treat cough, asthma, fever, chronic bronchitis, diarrhea, rheumatism, inflammation, etc. Myrica esculena fruit is rich with several phytoconstituents like anthocyanins. The separation and identification of anthocyanins extracted from Myrica esculenta (Himalayan Bayberry) based on advanced analytical instrumentation technique High-Resolution Liquid Chromatography Electrospray Ionization Mass Spectrometry (HRLC-ESI-MS). Anthocyanins were identified by correlating their retention time, mass, molecular formula, and mass per charge ratio (m/z) with published data. We extract and identify five major anthocyanins derivative of Malvidin, Cyanidin, Petunidin, and Delphinidin from *Myrica esculenta* fruit (MEF), and the total monomeric anthocyanin content (TMAC) was found 0.58 ± 0.4 mg/100 g FW (fruit weight).

Keywords: Myrica esculenta, Anthocyanins

Full Length Papers

Phytochemical Properties and Biological Importance of Neem (*Azadirachta indica*)- An Overview

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Abstract

The medicinal tree has been used for years to cure diseases all over the world in everyday life. In the sub-continent, *Azadirachta indica* is a very useful traditional medicinal plant. There are several medicinal properties in of part of the tree. *Azadirachta indica* leaf extract contains pharmacologically bioactive constituents that may be responsible for its anti-micro-organism activity. Steroids, phenolic compounds, alkaloids, glycosides, terpenoids, tannins, and flavonoids. Phytochemicals are plant-produced chemical compounds, typically to help them survive or thwart rivals, predators, or pathogens. *Azadirachta indica* (Neem) is an evergreen tree grown in different regions of the subcontinent. As traditional medicine, every part of the tree has been used as a household remedy against various ancient oils. Neem has been widely used as medicine for Ayuveda, Urani and Homeopathy.

Keywords: Neem, phenolic, phytochemical, tree

Introduction

The Sanskrit name of the Neem tree is Arishtha, which means sickness reliever (Kausik et al. 2002). In the middle of the 20th century, chemical research on the products of the Neem tree was extensively carried out. The Neem Tree is an extraordinary plant that the United Nations has named the Tree of the 21st century (Puri, 1999). It is widely referred to in India as 'Divine Tree',' Life giving tree',' Nature's Drugstore',' Village Pharmacy' and 'All disease panacea' (Shoforowa, 1993). Neem (*Azadirachta indica*) is an evergreen, sturdy tree belonging to the Meliaceae family. It is found mainly in the world's tropics and sub-tropical regions (Africa and Asia). The tree is medium to broad and has brown to dark grey bark and thick rounded pinnate leaves (Ogbuewu, 2008).

The species has been the focus of research into botanical pesticides. The Meliaceae, especially *A. Indica* (Neem tree) comprises at least 35 concepts which are biologically active. The predominant insecticidal active ingredient in the seeds, leaves, and other parts of the neem tree is azadirachtin. Various modes of action against insects such as antifeedancy, growth control, fecundity suppression and sterilisation, oviposition repellency or attractance, improvements in biological fitness, and blocking the production of vector-borne pathogens are shown by

Azadirachtin and other compounds in neem products. It can be used as a treatment to alleviate diabetes, eczema and fever. It is possible to use Barks of Neem to make a toothbrush and the roots have the potential to cure diseases and insects. The seeds of the Neem tree have a high oil concentration. Neem oil is commonly used for various diseases such as diabetes and tuberculosis as insecticides, lubricants, medicines (Kumar *et al.* 2009).

The most influential phytochemical pesticides in recent years are those extracted from Neem trees, which have been extensively researched and used for medicinal and cosmetic purposes in the fields of entomology and phytochemistry. The products of Neem were obtained from neem trees of the Meliaceae family. It has an extensive deep root system responsible for its existence in the world's arid and semi-arid regions. The chemical constituents include many biologically active substances, including alkaloids, flavonoids, triterpenoids, phenolic compounds, carotenoids, steroids, and ketones that can be extracted from Neem. Antibiotic resistance is a major concern and it may be useful to develop new plant agents to meet the need for new antimicrobial agents with increased protection and efficacy (Srivastra *et al*. 2002). The strong anti-bacterial activity of Azadirachta indica leaves indicates the existence of bioactive compounds and is useful for rationalising the use of this plant in primary health care (Koona and Budida, 2011). Hill (1985) stated that in certain chemical substances that create a definite physiological effect on the human body, the medical importance of plants lies.

Alkaloids, tannins, flavonoids and phenolic compounds are the most significant of these bioactive constituents of plants. Many scientists and organisations are actively looking for alternative drugs to conventional remedies. It has been estimated that about 25 percent of all medicines prescribed today are plant-based substances (Puri, 1999).

Species Description (Bijauliya*et al.* 2018**)**

The neem tree (*Azadirachta indica*) is a mahogany-related tropical evergreen growing quick (up to twenty feet in three years). In areas that experience intense heat of up to 120oF, it can develop where rainfall is as little as 18 inches per year and thrives. It is estimated that they will live for up to 200 years.

Leaves: compound, alternating, 0.1 cm thick, rachis 15-25 cm long; oblique base leaflets, opposite, exstipulate, lanceolate, acute, serrate, 7-8.5 cm long and 1.0-1.7 cm high, slightly yellowish-green; scent, indistinct; bitter taste.

Stem Bark: Bark varies greatly in thickness according to age and areas of the tree from where it is taken; rough, fissured and rustygrey external surface; yellowish and foliaceous laminated inner surface, crack, fibrous; characteristic odour; bitter taste.

Crop, fruit and seeds: In the early summer, the tree is sometimes covered with delicate flowers. The flowers (white and fragrant) are axillary arranged, usually with more or less drooping panicles that are up to 25 cm long. It has an olive-sized, semi-sweet fruit. With considerable medicinal and botanical properties, the seed inside is rich in oil. By pressing the kernels in a

juicer, the oil is easily collected. It normally starts to bear fruit at three to five years of age and can yield up to 110 lbs. Annual berries, when ripe.

Phytochemical of Neem-

Extraction, screening and recognition of the active medicinal products present in plants. This involves screening for the presence of alkaloids, glycosides, flavonoids, sugar reduction, terpenoids, saponins, tannins, using the following methods. The leaves extracted with the appropriate solvent and the compulsory reagent were combined with the correct quantity of the extract. Active chemical constituents such as alkaloids, flavonoids, glycosides, triterpenoids, hormones, tannins and phenols are present, reducing sugar, carbohydrates, protein and amino acids. Flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds are some of the bioactive substances that can be obtained from plants. Compounds recognised as essential nutrients, which are naturally found in plants and are necessary for normal physiological functions, are included in the phytochemical group, so they must be obtained from the human diet. Some phytochemicals are considered to be human-toxic phytotoxins. For example aristolochic acid is carcinogenic at low doses. Some antinutrients that interfere with nutrient absorption are phytochemicals. Others, such as certain polyphenols and flavonoids, can be high-intake pro-oxidants (Rout *et al.* 2020).

Streptomycin showed an improved bactericidal activity when combined with A.indica leaf extract and can be used to treat infections caused by these bacteria. The preliminary phytochemical studies were carried out by qualitative type and it was found from the phytochemical investigations that the extracts contained alkaloids, tannins and phenolic compounds, flavonoids, terpenoids and steroids, saponins, glycosides and sugar reduction. These compounds often help to protect the plant from microorganism infection, insect predation and herbivores, while some plants have their odours and or tastes and some are still responsible for their pigments (Mahmood *et al*. 2008).

Because of the rich source of different types of ingredients, there were some Active Compounds of Azadirachta indica (Neem) such as azadirachtin and the others are nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, and quercetin. It was found that Azadirachta indica (Neem) has a therapeutic function in health management. Nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol, amino acid, 7 desacetyl 7 benzoylazadiradione, 7 desacetyl 7 benzoylgedunine, 17 hydroxyazadiradione and nimbiol. Quercetin and ß-sitosterol, polyphenolic flavonoids, have been isolated from fresh neem leaves and are considered to have antibacterial and antifungal effects, and seeds produce useful constituents such as gedunine and azadirachtin. Because of the rich source of antioxidants and other useful active compounds such as azadirachtin, nimbolinin, nimbin, nimbidin, nimbidol, salannin, and quercetin, Azadirachta indica may be considered to play a therapeutic role.

Conclusion

From this analysis, *Azadirachta indica* leaf extract can be concluded to have antibacterial activity against dental pathogens. It is anticipated that the use of natural products as therapeutic agents in

microorganisms would probably not evoke resistance. This may illustrate the reason for the use of the plant in treating infections in traditional medicine. As the plant is easily obtainable and the extract can easily be produced through a simple maceration or infusion process, the plant may be a genuine and cheaper replacement for traditional drugs. Research on the isolation and purification of the active components of this natural herb and its use in laboratory animals should continue to be important.

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"Attitude of Horticultural Farmers about Backward and Forward Linkage Services of Private Advisory Services"

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Abstract:

The principle objective of the present study was to ascertain the attitude of horticultural farmers towards the Private Advisory Services (PAS) received from the Private Advisory Service Agencies (PASA). The sample consisted of randomly selected 120 farmers from 12 villages of three taluks of Chitradurga district. For measurement of attitude, a structural schedule was developed and personal interview technique was used for collection of data from the respondents. For the analysis of data Frequency distribution (*f*), percentage (%), Mean and SD were used. The findings of the study revealed that, more than half 54.17 per cent of the respondents expressed most favourable attitude towards the statement "PASA helps farmers to get inputs at the right time" in input domain. Majority (63.33%) of the respondents showed favourable attitude towards the statement "PASA helps farmers to get need based technical service easily and quickly" in technological domain. With respect to marketing domain, majority (43.33%) of the respondents expressed favourable attitude towards the statement "The intervention of PAS results in the adoption of better post-harvest practices". However, nearly half (48.33%) of the respondents expressed favourable attitude towards the statement "PASA will involve in documentation and processing of loan applications which is required by the farmers" in credit domain. The higher proportion 72.50 per cent of the farmers expressed favourable attitude towards advisory services received by PASA.

Key Words: Advisory services, Attitude, Linkage, and Privatization.

1.Introduction

With the growth of technology, modernization and changes in food habits of the people, horticulture sector has undergone a major shift in the recent past and got a tremendous potential to push overall agriculture growth (Bahadur,2010)[1].Horticulture crops were encouraged in Indian cropping pattern which improves soil health, environment and have less pressure on land compared with traditional crops. (Singha & Chakravorty, 2013)[2].At present, the sector has become the most profitable venture of all farming activities, as it provides ample employment opportunities and scope to raise the income of the farming community in the country (Choudhary, Singha, & Vishnu, 2013)[3].

Consumption of fruits and vegetables in the country are on rise in rural areas, they increasing at an annual growth rate ranging between 18 to 23 per cent for fruits and 10 to 20 per cent for vegetables. Farmers generally consult neighboring progressive farmers for information and advices. Another major source of advice is the local input dealer. There are an estimated 282,000 input dealers in India. Out of which most of them are positively involved in providing advisory services one or other way to solve the farmers' problems. Some input firms such as 'AGROCEL' and 'Tata KisanKendras'provide free consultancy services. Emergence of paid extension services in agriculture is a relatively recent phenomenon. Farmers require a diverse range of information to support their farm enterprises. Information is needed not only on best practices and technologies for crop production, which the traditional public-sector extension system provided during the green revolution, but also information about post-harvest aspects including processing, marketing, storageandhandling.With the intent to provide timely and qualityadvice to farmers some of the private actors like Input dealers and seed/input companies' (information provided with sale of inputs) etc., provide free/fee advisory services to farmers on suitability, procurement and application of various inputs such as seed, fertilizer, pesticide and improved farming practices covering both backward and forward linkage. To ascertain the attitude of respondents towards backward and forward linkage services of PASA the present study was conducted.

The main objective of this investigation was to studythe attitude of horticulture farmers towards private advisory services (PAS) given both in backward and forward linkagein horticulture crops.

2. Materials and Methods

The study was conducted in Chitradurga district of Karnataka stateduring the year 2019-20.

Selection of study area

Chitradurga district was purposively selected as more dry land horticulture crops (including fruits, vegetables and plantation crops) were grown there. The district comprises six taluks among them three taluks are selected, *i.e.*, Chitradurga, Challakere and Hiriyur taluks. The

villages were selected using the criteria of availability of maximum number of farmers cultivating horticulture crops.

Selection of respondents

Total of 120 respondents were randomly chosen from the selected 12 villages who were growing horticultural crops and taking advisory services from private agencies particularly local trained people and private companies.

Measurement of Attitude

Attitude is "the degree of positive or negative effect associated with some psychological object". In this study attitude refers to the degree of positive or negative effect or feelings of the farmers about the private advisory services (PAS).

To measure attitude statements were framed and grouped under four different domains as input, technological, marketing and credit domain respectively. Responses of farmers were recorded on 3 point continuum scale of "Agree", "Undecided" and "Disagree" of attitude measurement and were given 3, 2and1 score respectively.On the basis of Mean and Standard deviation, result were categorized into three categories as less favourable, favourable and more favourable.

Method of data collection

. The data was collected with the help of pre-tested structured interview schedule. The researcher personally visited the respondent farmers to obtain the data. The respondents were assured of the secrecy of the data and were encouraged to give unbiased answers.The data collected was analyzed using MS-Excel computer software.

3. Results and Discussion

3.1 Attitude of horticultural crop growers on different domains of backward and forward

Linkage services

It is evident from the table 1 thatmore than half 54.17 per cent of the respondents expressed most favourable attitude towards the statement "PASA helps farmers to get inputs at the right time". The reason for this may be PASA responsibility is to make availability of right inputs at right time to the farmers. The horticultural crop growers might satisfied with the service providing agencies with respect to input availability for their crop production. Hence, respondents expressed most favourable attitude. Majority 51.67 per cent of the farmers expressed favourable attitude towardsthe statement"PASA supply inputs to the farmersdoor

step". The probable reason may be that the farmers get reliable inputs as per consultancy received by concerned agencies. This tendency was observed by all four horticultural crop growers with respect to availability of inputs to their door steps.

The table also showed that, majority 60.00 per cent had less favourable attitude towards the statement "PASA made recommendation without considering the availability of inputs". The reason for this may be that before taking the consideration of availability of right inputs in the market, private agencies recommend inputs to the farmers. Hence, they might showed less favourable attitude.

Majority 42.50 per cent of the respondents expressed more favourable attitude towards the statement "Farmer is always eager to know about new practices in horticultural crops by PASA". The probable reason for this was the horticulture crops gives higher income and improve living standards. To get the higher yield and returns, farmers need to adopt new innovations in crop production. In this regard farmers showed a positive view towards the statement.

Majority (63.33%) of the respondents showed favourable attitude towards the statement "PASA helps farmers to get need based technical service easily and quickly". The probable reason was due to that PASA give concern towards provide information in both backward and forward linkage aspects which solves horticultural crop production problems. Hence, farmers presumed that PASA helps them to get need based technical services.

With respect to marketing domain, majority (43.33%) of the respondents expressed favourable attitude towards the statement "The intervention of PAS results in the adoption of better post-harvest practices". The reason for this may be that farmers expect to get good returns from their produce. There is a wider scope for the horticulture crops to sell in market after processing. The farmers interested to take up processing of horticultural crops possibly by their own, it leads to increase the profit of the farmers. Therefore they eagerly obtained information about processing of horticultural crops which they can do at farm level and they might received expected information from the service providing agencies. Hence, respondents mightexpressed favourable attitude.

Further, Table 11 gives information related to credit domain. Majority (36.67%) of the respondents showed favourable attitude towards the statement "Good support provided by the PASA in availing the credit facilities will increase the interest of the farmers to adopt innovative technologies in horticultural crops". The reason for this might be that though main responsibility of the private agencies was to provide information related to crop production aspects. In few cases the service providing agencies were involved in providing information about availability of credit facilities, so as farmers can invest more capital on adoption of new technologies in their horticulture crop production.Hence, respondents might showed favourable attitude towards the statement.

Nearly half (48.33%) of the respondents expressed favourable attitude towards the statement "PASA will involve in documentation and processing of loan applications which is required by the farmers". The reason for this was the documentation for availing agriculture credit from financial institutes is hectic task and involved complex procedures. In some cases PASA involved in preparation of project proposals to avail credit facilities from financial institutes. Hence, respondents mightexpressed favourable attitude towards the statement.

3.2 Overall attitude of horticultural crop growers about backward and forward linkage services of PASA

The result of the overall attitude of farmers presented in Table 2 revealed that, the higher proportion 72.50 per cent of the farmers expressed favourable attitude followed by 15.83 and 11.67 per cent expressed less and more favourable attitude towards backward and forward linkage services received by Private Advisory Service Agencies (PASA).This indicates that the farmers realized the advantages of PASA in horticultural crop production. This may be due to better socio-economic status and close interaction with the PASA. The respondents had realized that the information from existing sources was not sufficient and may not match with the farmers needs. In recent years, there is an increasing trend of horticultural growers to take extension services from the private sector for advice to maximize their profit. Hence, farmers showed high favourableness towards PAS. The less favourable attitude in some cases of PAS might be due to the more commercial nature of private agencies due totheirprofit oriented strategies and service providing agencies had limitations in activities to cover. The results are conformity with the research findings of Saravanan (2000)[4], Sridhar. K (2001)[5]and Sravanthi. B (2011)[6].

Table 1: Domain wise horticultural crop growers' attitude towards backward and forward linkage services

n =120

Sl. No	Domains	A		UD		DA	
		F	P	F	P	F	P
A	**Input domain**						
1	PASA helps farmers to get inputs at the right time	65	54.17	48	40.00	7	5.83
2	PAS agencies supply inputs to the farmers' doorstep	33	27.50	62	51.67	25	20.83
3	I believe that PAS is beneficial as it reduces the use of more quantity of agrochemicals	47	39.17	56	46.67	17	14.17

4	PASA's made the recommendation without considering the availability of inputs	20	16.67	29	24.17	72	60.00
5	Private agencies are just acting as a sales center for the farm inputs	32	26.67	35	29.17	53	44.17
B	**Technological domain**						
1	PASA teach new techniques to farmers with an interest	30	25.00	60	50.00	30	25.00
2	PASA helps farmers to get need based technical service easily and quickly	33	27.50	76	63.33	11	9.17
3	Farmers do not had faith in technology provided by PASA	24	20.00	32	26.67	64	53.33
4	PAS is a step towards extending the new technologies in horticultural crops	48	40.00	67	55.83	5	4.17
5	Farmer is always eager to know about new practices in horticultural crops by PASA	51	42.50	52	43.33	17	14.17
6	PASA's try to push through their products without looking into the quality of product	29	24.17	59	49.17	32	26.67
7	PASA failed to provide financially feasible techniques	43	35.83	36	30.00	41	34.17
8	The technical information given by PASA consultants during their visits is well defined, suitable and applicable	38	31.67	62	51.67	20	16.67

C	**Marketing domain**						
1	PASA ensure better market facility to farmers	13	10.83	45	37.50	62	51.67
2	PASA purchase produce from the production point	0	0.00	0	0.00	120	100.00
3	PASA helps farmers in the processing of horticultural produce	2	1.67	32	26.67	86	71.67
4	PASA brings farmers close to markets to sell horticultural produce	8	6.67	34	28.33	78	65.00

5	The intervention of PAS results in the adoption of better post-harvest practices	11	9.17	52	43.33	57	47.50
6	PASA intervention will make many restrictions on the farmers to sell horticultural produce in open markets	9	7.50	23	19.17	88	73.33
7	PASA provides market information about horticultural crops	8	6.67	44	36.67	68	56.67
D	**Credit domain**						
1	PASA helps farmers to get linkage with financial Institutes for credit facilities	25	20.83	39	32.50	56	46.67
2	PASA involve in documentation and processing of loan application which is required by farmers (documentation like RTC, NOC, EC)	14	11.67	58	48.33	48	40.00
3	PASA not take the financial risk which occurs by the financial institutes	19	15.83	51	42.50	50	41.67
4	Good support provided by PASA in availing the credit facilities will increase the interest of the farmers to adopt innovative technologies in horticultural crops	44	36.67	43	35.83	33	27.50
5	Farmers do not had faith in PASA regarding financial support	22	18.33	35	29.17	63	52.50

F – Frequency P – Percentage

Table 2: Overall attitude of horticultural crop growers about backward and forward linkage services

n =120

Sl. No.	Category	F	P
1	Less Favourable	14	11.67
2	Favourable	87	72.50
3	More Favourable	19	15.83
		Mean=46.2	**SD=5.27**

F – Frequency P - Percentage

4. Conclusion

In conclusion, the results of present investigation reveals that medium to high level of favourableness was found among the horticulture crop growers towards PAS. More favourableness was showed towards input, technological and marketing domain. Comparatively less favorableness was expressed towards credit domain. This implies that horticulture farmers are in the interest of obtaining PAS, to improve their crop production activities. The intensive awareness programs like motivational and capacity building programs on innovative horticulture production activities need to take initiative. Changing the attitude of farmers towards adoption of new technologies is difficult task for Extension agents. The PASA should take responsibility to train the extension personnel working with them about the basic knowledge and requirements to address farmers' problems and to change their attitude positively.

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Storage Studies of Foxtail Millet Cookies

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Abstract:

Millet is known to be a drought-resistant crop, resistance to pests and diseases, short growing season as compared to other major cereals. Today's world's population is increasing, so there is also an urgent need to utilize underutilized crop not only because they are cheap but also are nutritionally superior. Baked products are considered as an excellent vehicle for fortification, value addition and feeding at mass scale. Baked products from foxtail millet can be made a good source of dietary fiber in the total food consumption as they are consumed and relished by all age groups. Cookies were prepared by using 100% foxtail millet flour, (80% foxtail millet flour + 20% wheat flour and 80% foxtail millet flour +20% maida). Physical characteristics of cookies for weight, diameter, thickness and spread ratio were studied. The development of product provides good amounts of proteins, fiber, vitamins and minerals. The product was evaluated for physical properties, such as weight, diameter, thickness and spread ratio. The effect of storage on physical properties of cookies stored in polyethylene pouch and laminated pouch were carried for sensory attributes of the product. It was found to be far better and appealing made with foxtail millet flour and maida flour (80%+20%) combination cookies stored in laminated pouch. Shelf life study and microbial analysis result showed that the product had good shelf life and there was no yeast and mould count even after 60 days of storage and the product taste and aroma was accepted.

Key Words: Foxtail millet, Cookies, Sensory Qualities, and Packaging material.

Introduction

Millet grain has substantial benefits as a draught resistant crop, yield good productivity in the areas with water scarcity, possesses remarkable edible and nutritive values, and ease of processing and food manufacturing. Millet is an alkaline forming grain that is gluten free.

Millets are also rich sources of phytochemicals and micronutrients, play many roles in the body immune system. Millets have nutraceutical properties in the form of antioxidants which prevents deterioration of human health such as lowering blood pressure, risk of heart disease, prevention of cancer and cardiovascular diseases, diabetes, decreasing tumor cases etc. Even though small millets are cultivated in the central dry zone of Karnataka especially in Chitradurga district the rural poor are un aware of usage due to lack of processing and value addition technology of small millets. In view of this steady increase in area and production of small millets in Chitradurga, the district is popularly known as "**millet bowl"** of Karnataka.

Cookies, otherwise known as biscuits, are popular cereal foods, commonly consumed by the populace, especially among the pre-school and school aged children. Cookies are ready-to-eat, convenient and inexpensive food snacks produced from unpalatable dough that is transformed into a light porous, readily digestible and appetizing product through the application of heat. The principle ingredients are wheat flour, fat, sugar and water, while other optional ingredients include milk, salt, flavoring agent, aerating agent and other food additives. Cookies are a rich source of fat, protein and carbohydrates; hence they provide energy and are also a good source of minerals (Kure, Bahago, & Daniel, 1998). They can be served with soft drinks or tea, and taken between meals like any other snacks.

The present work visualizes the exploitation of foxtail millet in cookies and evaluating its effect on the physical properties and storage study of cookies.

Materials and Methods

The present study was aims to determine the different storage studies of foxtail millet cookies conducted in the year 2019-20 at Department of Agricultural Engineering, College of Horticulture, Hiriyur. Foxtail millet (var. HMT 100-1) was procured from the farmer of Hiriyur taluk, Chitradurga District Karnataka. The processing was done and it was processed and cookies were developed in the laboratory The other ingredients such as butter, sugar. salt, milk and chili powder, etc. were proportionately added. This technology developed basically because to improve the health condition of the people. The glycemic index in foxtail millet is good nutrient for people who suffering from diabetics. In recent days value added products in millets are having higher demand from diversified people. In this background preparation of value added products by foxtail millts is essential evenCookies is most preferred products among all age group people. Hence, preparation of Cookies is good avenue to provide employment opportunities to SHG members in rural areas in this background thought put into action by identifying appropriate storage studies.

Preparation of Foxtail Millet Flour

The Foxtail millet grains were cleaned to remove any impurities by hand picking. Then the grains were milled in food pulverizer to make flour and the flour obtained was sieved in mesh by the SHG women to obtain fine Foxtail Millet Flour.

Preparation of Cookies

Cookies were prepared using the traditional creamery method described by Whitley (1970) the ingredients include 100% foxtail millet flour, 80% foxtail millet flour +20% wheat flour and 80% foxtail millet flour +20% maida. The cream was mixed with flour; sufficient quantity of milk was added to form dough. Then dough was divided into small pieces. The pieces were rounded, flattened and placed in the baking tray smeared with butter and baked in a commercial baking oven withtop temperature of 180°C and bottom temperature of 150° C for 20 minutes. The cookies were allowed to cool, packed in polyethylene pouch and laminated pouch and stored at ambient temperature (Cure et al, 1998) then the cookies were evaluated for sensory attributes and storage studies.

Determination of Physical Properties of the Cookies

Physical properties of the cookies were determined according to AACC (2000) methods. Six cookies were weighed on an electronic weighing balance (Mettler Toledo). The diameter was predetermined by placing six cookies edge to edge using a ruler. The cookies were rotated at an angle of 90° for duplicate readings. The height was measure by placing six cookies on top of one another using a ruler. The spread factor was expressed as the ratio of the diameter to the thickness of the cookies. All measurements were carried out in triplicate and the cookies colour was recorded by visual observation.

Cookies were subjected to organoleptic evaluation for sensory quality parameters such as appearance, colour, texture, taste, flavor and overall acceptability on nine pointHedonic scale by 20 semi trained judges comprising of staff of College of Horticulture, Hiriyur. University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka.

Microbial Analysis

The nutrient agar media(NA) was used for total plate count, while potato dextrose agar(PDA) for yeast and mold, Serial dilutions were made for each sample and 1 ml of the appropriate dilution was poured, 10^{-2} and 10^{-1} serial dilution were used for pour plate in

triplicate on selective media. Culture media was incubated at 37°C for 24 hrs for enumeration of the total microbial load in incubator. Developed colonies were expressed as colony forming units per gram (cfu/g) of sample.

Statistical analysis

The data obtained was analyzed statistically to determine statistical significance of treatments. Completely Randomized Design (CRD) was used to test the significance of results (Panse and Sukhatone, 1967). The analysis of variance revealed at significance of $P<0.05$ level, S. E. and C.D. at 5% level was mentioned wherever required.

Results and Discussion

Effect of storage on physical properties of Cookies

The visual observation of stored cookies at the 60 days indicated no insect infestation in both the packages on other hand, there was a gradual change in its colour, and there was slight discoloration in contents of polyethylene pouch from 30days onwards. Packaging materials have a role in determination of shelf life in terms of moisture uptake and altering the levels of nutrient value there by affecting the acceptability. However in the present investigation, the moisture content being low (5%) contributed to good storage stability of cookies.

Microbial analysis and moisture content of cookies stored for 60 days revealed an increase in the levels of both parameters in the two different packaging materials used. Relatively higher levels changes observed in cookies stored in polyethylene packages than the aluminum laminated packaging materials. This may be attributed to the hygroscopic nature of LDPE (Low Density Polyethylene) material, when stored for longer duration (Briston, 1980) the microbial analysis of cookies stored in polyethylene pouch at 60 days was 1.6 cfu/g of Total Plate Count (TPC) and that of laminated pouch was 1.4 cfu/g of TPC could be due to higher oxygen transmission rate of polyethylene cover, there by increased production of degradation compounds and due to exposure of foods in transparent pouches. Both the cases of packages yeast and mould count was not detectable at 60th day also.

Sensory quality of cookies

The results of mean scores for different sensory attributes such as appearance, color, texture, taste, flavor and overall acceptability of cookies as influenced by packaging material and storage period are presented in table no. 5.

Color and appearance

A gradual decrease in mean score for color from 8.5 to 8.1 was observed for 60 days of storage for polyethylene pouch. Whereas in laminated pouch from 8.5 to 8.3 on 60th day of storage. The results obtained present in the investigation are concurrent with literate. Mean score of color was from 8.4 to 8.0 in polyethylene pouch, whereas in laminated pouch ranges from 8.4 to 8.2 the color changes during storage might be due to color acceleration of maillard reaction, absorption of moisture content during storage maillard reaction in cookies (Bender, 1996)

Texture and flavor

The mean texture score was found to be decreased from 7.5 to 7.0 (polyethylene pouch) during the storage of cookies for two months the maximum score for texture range was 8.0 to 7.8 (laminated pouch). The gradual decrease in texture score was due to softening effect resulting from gain of moisture during storage was observed. Cookies packed in polyethylene pouch showed more moisture gain during storage and become soft compare to laminate pouch this might be due to high water vapour transmission rate of polyethylene as compare to laminated packages. Similar results are presented by Wade (1988) for biscuits, cookies and crackers; Bender (1996) for cookies and but *et al*. (2007). They reported the same decreasing trend in texture with increase in storage time. Nagi *et al*. (2012) reported gain in moisture of biscuits during storage in HDPE and laminate package might be due to hygroscopic nature of dried product, storage environment (temperature, relative humidity) as well as nature of packaging material. Kulthe *et al*. (2014) reported similar results during storage (90 days) of cookies as influenced by different packaging material.

It is clear from the data that a gradual decrease in score for flavor from 7.3 to 6.9 was observed in polyethylene pouch. The flavor retention was comparatively higher in case of laminated package *i.e*. 7.3 to 7.1. The flavouring compounds might be lost at higher rate during storage that lowered the flavor score. This may be due to high gas transmission rate of polyethylene compared to other packaging materials (Paine, 1969). Sathe *et al*. (1981) reported development of rancid flavor in crackers prepared from soya flour and groundnut flour after 60 days of storage. The flavor changes during storage might be due to absorption of moisture contains during storage that caused flour deterioration in cookies Wade (1988). Gupta and Singh (2005) reported reduced flavor score of maize fortified biscuits during storage. Kaur (2005) reported that flavor changes were higher in case of cookies stored in LDPE as compare to those stored in laminate package because of the fact that aluminum laminates protects then biscuits from light which acts as catalyst for oxidation.

Taste

The gradual decrease in score for the taste of cookies from 7.5 to 7.0 (Polyethylene) and 7.5 to 7.2 (Laminate pouch) was observed during the storage period. The highest score of taste was observed for cookies packed in laminated package for two months storage indicating slight deteriorative change. This might be due to low water vapour transmission rate and gas transmission rate of laminated package as compared to polyethylene packages. It was reported that taste score decreased during storage with respect to storage conditions and period of storage. The results obtained in the present investigation for cookies are in agreement with literature. Wade (1988) and Bender (1996) reported the same decreasing trend in taste of cookies, biscuits and crackers with increasing in storage time. Jood *et al.* (2001) also reported gradual decrease in taste score of β- carotene and iron rich biscuits and *shankarpara.* Narender *et al*. (2007) also reported change in taste of biscuits stored for 60 days under ambient conditions. Kulthe *et al.* (2014) reported similar trend for taste variation while studying effect of packaging material on sensory quality of cookies during storage for 90 days. The taste of cookies produced from 100% FMF was impaired (low acceptability). So the score for the taste of cookies was 6.5 while the taste of 80 FMF + 20% wheat flour was 7.8 which is slightly higher than 100% FMF cookies and highest taste value (8.2) was recorded in 80% FMF + 20% Maida flour cookies of the fresh samples.

Overall acceptability

The data showed decrease in overall acceptability mean score from 7.2 to 6.8 in polyethylene pouch and 7.2 to 7.0 in laminated pouch during storage of cookies for two months. The maximum score of 7.8 was observed for treatments 80% FMF + 20% maida flour cookies for laminated pouch at ambient storage condition. While treat 100% FMF cookies showed fair score (6.0) for overall acceptability in polyethylene comparison to other treatment. It might be due to faster deterioration in respect of colour and appearance texture and flavor, crispiness and taste of cookies packed in polyethylene package. It was observed that the overall acceptability score for all samples decreased during storage with respect to storage condition and period. It is in conformity with the results obtained by various researches. The results of the present investigation are in conformity with the results obtained by various researches. Sathe *et al*. (1981) reported that crackers packed in PP bags could be stored for about 60 days at normal conditions. Similar results are presented by Wade (1998), Bender (1996), Jood *et al.* (2001), Butt et al. (2007) and Gupta and Singh (2005). They reported Narender *et al*. (2007) also concluded that biscuits could be stored at ambient temperature (30-35^{0}C) for 60 days without any undesirable changes in the sensory attributes. Kulthe *et al*. (2014) reported that cookies could be stored for more than 90 days without affecting their sensory quality.

Table 1. Sensory attributes of cookies preparedfrom foxtail millet flour, wheat flour andmaida stored in polyethylene pouches (No of days)

Sensory attributes	Appearance(Days)			Colour			Texture			Taste			Flavour			Overall acceptability		
	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60
100% FMF Cookies	8.4	8.4	8.0	8.3	8.2	7.9	6.2	6.2	5.8	6.5	6.5	6.0	6.4	6.4	6.0	6.3	6.3	6.0
80% FMF + 20% Wheat flour	8.5	8.5	8.1	8.5	8.5	8.2	7.9	7.9	7.6	7.8	7.8	7.3	7.2	7.2	6.9	7.4	7.4	6.9
80% FMF + 20% Maida	8.6	8.6	8.2	8.4	8.4	8.0	8.0	8.0	7.7	8.2	8.2	7.8	8.4	8.4	8.0	7.9	7.9	7.6
Mean	8.5	8.5	8.1	8.4	8.3	8.0	7.4	7.4	7.0	7.5	7.5	7.0	7.3	7.3	6.9	7.2	7.2	6.8
S. Em±	0.051	0.051	0.051	0.051	0.051	0.045	0.039	0.039	0.051	0.047	0.047	0.039	0.054	0.054	0.042	0.054	0.054	0.058
CD	N/A	N/A	N/A	N/A	0.15	0.139	0.122	0.122	0.159	0.146	0.146	0.122	0.167	0.167	0.132	1.167	1.167	0.182

Table 2. Sensory attributes of cookies prepared from foxtail millet flour, wheat flour and maida stored in laminated pouches (No of days)

Sensory attributes	Appearance (Days)			Colour			Texture			Taste			Flavour			Overall acceptability		
	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60
100% FMF Cookies	8.4	8.4	8.3	8.3	8.3	8.1	6.2	6.2	6.0	6.5	6.5	6.3	6.4	6.4	6.2	6.3	6.3	6.1
80% FMF + 20% Wheat flour	8.5	8.5	8.3	8.5	8.5	8.4	7.9	7.9	7.7	7.8	7.8	7.5	7.2	7.2	7.0	7.4	7.4	7.2
80% FMF + 20% Maida	8.6	8.6	8.4	8.4	8.4	8.2	8.0	8.0	7.8	8.2	8.2	8.0	8.4	8.4	8.2	7.9	7.9	7.8
Mean	8.5	8.5	8.3	8.4	8.4	8.2	7.4	7.4	7.1	7.5	7.5	7.2	7.3	7.3	7.1	7.2	7.2	7.0
S. Em±	0.051	0.051	0.051	0.051	0.051	0.051	0.039	0.039	0.058	0.047	0.047	0.064	0.054	0.054	0.058	0.054	0.054	0.056
CD	N/A	N/A	N/A	N/A	N/A	0.159	0.122	0.122	0.182	0.146	0.146	0.199	0.167	0.167	0.182	1.167	1.167	0.174

Effect of storage on the physical properties of cookies packed in LDPE was analyzed at ambient atmospheric condition for 60 days and results are shown in (Table 2). Means determined at fresh was 13.44mm that decreased to 13.38 in 100% FMF and 80% FMF+20wheat flour cookies and 13.36mm in case of 80% FMF+20% maid flour cookies at 60 days. Similarly, Tahira et al (2014) also reported decrease in thickness in cookies during storage.

Hence, present study was conducted with objective to utilize foxtail millet flour to prepare cookies and to study shelf stability for two months at an interval of 15 days on the basis of physical parameters and sensory attributes. Cookies developed will show good functional characteristics with improved health benefits due to foxtail millet flour. The decision to adopt utilization of 100%, and 80% FMF was motivated by the need to improve nutritional status, physical state and the functionality of the product.

The main purpose of preparing 100% FMF and other ingredients along with this is to make use of FMF and the cookies and other Millet processed products were prepared in the lab and demonstrated to Self Help Group women (SHG) group of Hiriyur taluk of Kasaba Hobli of VaniVilaspura in Chitradurga district. This region farmers were not aware of processing and utilization of millets due to lack of processing facilities. Because of this they were directly selling their produce to the market. After the intervention of training programme their annual income increased through processing and value addition of foxtail millet products. The impact of entrepreneurial activities on the status of SHG women after training and demonstration was increased.The score for the sensory attributes reduced sharply with increase in the substitution level of FMF when compared to Maida and Wheat flour sample.These results given are in good agreement with those reported by Ranasalva, N. (2014) who found that 50% of CFPM (Cooked Fermented Pearl Millet) flour with refined wheat flour of cookies is good for consumption.

In conclusion the results of this study indicate that, the physical characteristics and storage properties were affected by different levels and combinations of FMF. Cookies with FMF were light yellow in colour as compared to maida and wheat flour incorporated cookies. Good quality cookies can be prepared by using HMT 100-1 variety of foxtail millet by substituting maida (20%) with 80%. of FMF was found to be suitable for cookie making in comparison with other two types (100% FMF and 80%FMF+20% wheat flour) of cookies. The use of foxtail millet flour in cookies making, and other food products, would greatly enhance the effective utilization of this crop in Chitradurga district in Karnataka. Foxtail millet is preferred as it has a higher glycemic index. Further work is necessary in terms of

long term effects of consumption of foxtail millet cookies on blood lipid profile and glycosylated haemoglobin of diabetic and cardiovascular patients.

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Phytocoenology of weeds in groundnut fields of Y.S.R.District.

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Abstract

A study of weed flora was carried out during kharif season 2016, 2017& 2018 respectively at cultivated groundnut fields of Y.S.R.District. An incidental sampling units were taken and weed population was calculated. In this survey 31 common weeds were noticed. Among them,***Celosia argentea*** **L** (26, 100, 26) has highest and ***Echinochloacolona***(0.1, 10, 1.0) has least Density, frequency and abundance values.This study emphasizes that the weeds are answerable for the reduction of groundnut yields

Key words : Phytocoenology, Quadrat, Density, Frequency, Abundance, Allelopathy.

Introduction :

Groundnut fields of Y.S.R.District were fertile, red, loamy soils and infested with many weeds. Awareness of weed frequency, Density and abundance is necessary to raise the grain production. Y.S.R.district is lies between 14.5767N, 78.8383E. Phytocoenology is also known as phytosociology, plant sociology and plant ecology. Phytocoenology is a combination of plants that grow uniformly together. It explains the history, distribution, ecology, classification and structure of plants.

Materials &Methods :

Survey of weed flora was conducted in groundnut fields of Y.S.R.District from kharif 2016, 2017 & 2018 respectively by using standard list count quadrat method (Misra, 1968, Saritha, 2013).Weed population in groundnut fields were recorded by taking anincidental sampling units. Density, frequency, abundance, relative density and relative frequency of weed species were calculated by using following formulas.

Density:Total number of species in sampling units

Total number of sampling units examined.

Frequency :Number of sampling units in which the species occurred ×100.

Total number of sampling units examined.

% of frequency	Frequency class
0 - 20	A
21 - 40	B
41 - 60	C
61 - 80	D
81 - 100	E

Abundance :Total number of species in all the sampling units

Number of sampling units in which species occurred.

Relative frequency :Frequency of one species × 100

Total number of all species

Relative Density :Total number of species × 100

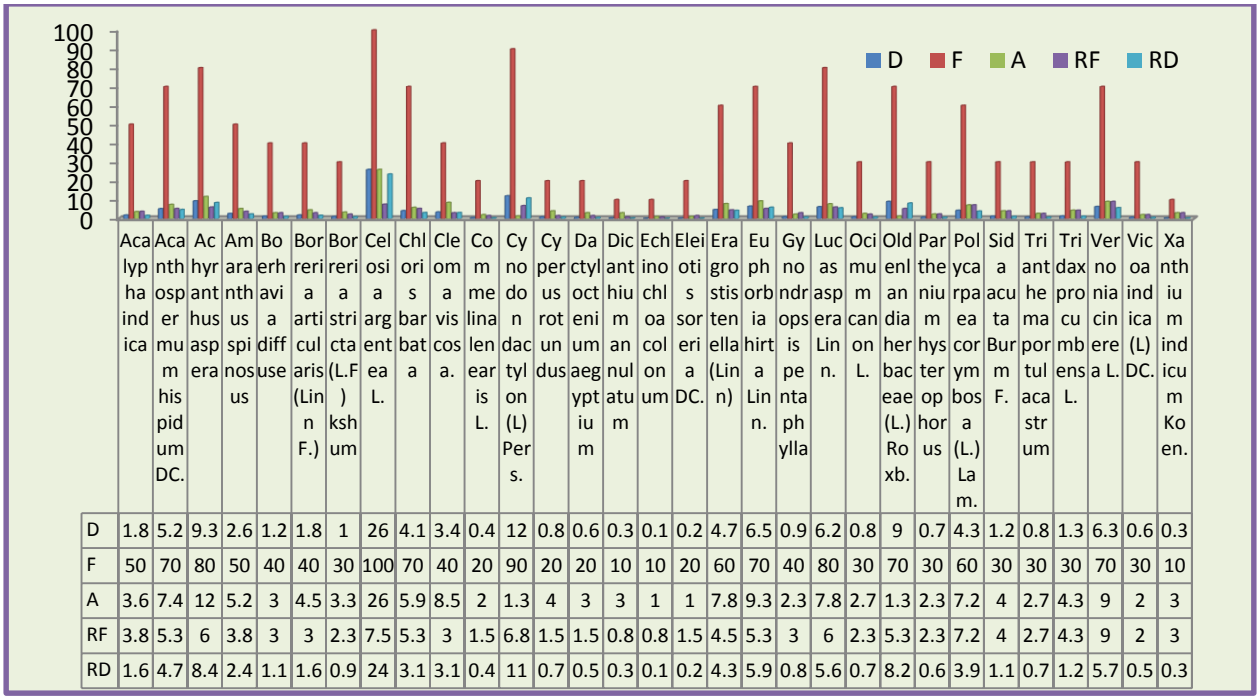
Total number of all species

Results &Discussion:

Table 1: **Phytocoenologyof weeds**

S.No	**Name of the species**	**D**	**F**	**A**	**RF**	**RD**	**% of F**
1	***Acalyphaindica* L.**	1.8	50	3.6	3.75	1.63	C
2	***Acanthospermum hispidum* DC.**	5.2	70	7.42	5.26	4.71	D
3	***Achyranthusaspera* L.**	9.3	80	11.62	6.01	8.43	D
4	***Amaranthusspinosus* L.**	2.6	50	5.2	3.75	2.35	C
5	***BoerhaviadiffusaL.nom.cons.***	1.2	40	3.0	3.0	1.08	B
6	***Borreria articularis* (Linn F.)**	1.8	40	4.5	3.0	1.63	B
7	***Borreria stricta* (L.F) kshum**	1.0	30	3.33	2.25	0.90	B
8	***Celosia argentea* L.**	26	100	26	7.51	23.57	E

9	***Chloris barbata*(L) sw**	4.1	70	5.85	5.26	3.08	D
10	***Cleomaviscosa* L.**	3.4	40	8.5	3.0	3.08	B
11	***Commelina lenearis* L.**	0.4	20	2	1.5	0.36	A
12	***Cynodon dactylon* (L) Pers.**	12	90	1.33	6.76	10.87	E
13	***Cyperusrotundus* L.**	0.8	20	4	1.5	0.72	A
14	***Dactylocteniumaegyptium*(L) Willd**	0.6	20	3	1.5	0.54	A
15	***Dicanthiumannulatum* (Forssk) staff.**	0.3	10	3	0.75	0.27	A
16	***Echinochloacolona*(L) Link.**	0.1	10	1	0.75	0.09	A
17	***Eleiotis soreria* DC.**	0.2	20	1	1.5	0.18	A
18	***Eragrostis tenella* (Linn)**	4.7	60	7.83	4.51	4.26	C
19	***Euphorbia hirta* Linn.**	6.5	70	9.28	5.26	5.89	D
20	***Gynondropsispentaphylla*(L) DC.**	0.9	40	2.25	3.0	0.81	B
21	***Lucas aspera* Linn.**	6.2	80	7.75	6.01	5.62	D
22	***Ocimum canon* L.**	0.8	30	2.66	2.25	0.72	B
23	***Oldenlandia herbaceae* (L.) Roxb.**	9	70	1.28	5.26	8.15	D
24	***Partheniumhysterophorus* L.**	0.7	30	2.33	2.33	0.63	B
25	***Polycarpaea corymbosa* (L.) Lam.**	4.3	60	7.16	7.16	3.89	C
26	***Sida acuta* Burm F.**	1.2	30	4	4.0	1.08	B
27	***Trianthemaportulacastrum* L.**	0.8	30	2.66	2.66	0.72	B
28	***Tridax procumbens* L.**	1.3	30	4.33	4.33	1.17	B
29	***Vernonia cinerea* L.**	6.3	70	9	9.0	5.71	D
30	***Vicoa indica* (L) DC.**	0.6	30	2	2.0	0.54	B
31	***Xanthium indicum* Koen.**	0.3	10	3	3.0	0.27	A



	Acalypha indica	Acanthospermum hispidum DC.	Achyranthus aspera	Amaranthus spinosus	Boerhavia diffuse	Borreria articularis (Lin F.)	Borreria stricta (L.F) ksh um	Celosia argentea L.	Chloris barbata	Cleoma viscosa.	Commelina lenearis L.	Cynodon dactylon (L) Pers.	Cyperus rotundus	Dactyloctenium aegyptium	Dicanthium annulatum	Echinochloa colonum	Eleiotis soreria DC.	Eragrostis tenella (Lin n)	Euphorbia hirta Lin n.	Gynondropsis pentaphylla	Lucas aspera Lin n.	Ocimum canon L.	Oldenlandia herbaceae (L.) Roxb.	Parthenium hysterophorus	Polycarpaea corymbosa (L.) Lam.	Sida acuta Burm F.	Triantherma portulacastrum	Tridax procumbens L.	Vernonia cinerea L.	Vicoa indica (L) DC.	Xanthium indicum Koen.
D	1.8	5.2	9.3	2.6	1.2	1.8	1	26	4.1	3.4	0.4	12	0.8	0.6	0.3	0.1	0.2	4.7	6.5	0.9	6.2	0.8	9	0.7	4.3	1.2	0.8	1.3	6.3	0.6	0.3
F	50	70	80	50	40	40	30	100	70	40	20	90	20	20	10	10	20	60	70	40	80	30	70	30	60	30	30	30	70	30	10
A	3.6	7.4	12	5.2	3	4.5	3.3	26	5.9	8.5	2	1.3	4	3	3	1	1	7.8	9.3	2.3	7.8	2.7	1.3	2.3	7.2	4	2.7	4.3	9	2	3
RF	3.8	5.3	6	3.8	3	3	2.3	7.5	5.3	3	1.5	6.8	1.5	1.5	0.8	0.8	1.5	4.5	5.3	3	6	2.3	5.3	2.3	7.2	4	2.7	4.3	9	2	3
RD	1.6	4.7	8.4	2.4	1.1	1.6	0.9	24	3.1	3.1	0.4	11	0.7	0.5	0.3	0.1	0.2	4.3	5.9	0.8	5.6	0.7	8.2	0.6	3.9	1.1	0.7	1.2	5.7	0.5	0.3

Figure 1:Phytocoenology of weeds.

In present study, total 31 weed species were recognized in an unmanaged cultivated groundnut fields of Y.S.R.District. Density, frequency, abundance, relative Density, relative frequency values of weed species were calculated. Among them six monocotyledonous and 25 dicotyledonous weed species were identified. And most of the weeds are belonging to asteraceae and poaceaefamilies.

Groundnut (***Arachis hypogaea*** **L**)is one of the major leguminous edible oil seed crop in Andhra Pradesh. In Andhra Pradesh, the groundnut is cultivated around 6,60,000 ha during kharif season.It calculated that 77% of crop production has reduced due to weed infestation. Weeds have close proximity with crop plants. It compete with crop plants for water, nutrients and sunlight. They can survive even under unfavorable environmental situations. Weeds have fast growth rate and prolonged seed viability than crop plants. Allelopathic effects of weeds can delay or reduce the crop plant seed germination (Saritha P, 2013). Thus the weeds creating a major loss in crop production. Due to lack of awareness and financial resources, the farmers are unable to remove them from their fields. It's pose to adverse effect on crop production.

Conclusion: Phytocoenology of weeds in groundnut fields of Y.S.R.District showed the dominance of weeds. Itinfluencing direct economic loss to the farmers. This study emphasizes that the weeds are answerable for the reduction of crop yield.

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Onstraints of Aonla Production in India

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Abstract:

Among the indigenous fruit crops of Indian Subcontinent Aonla or Indian gooseberry (*Emblica officinalis*) is one of the prime member, specially known for its medicinal and therapeutic properties and also considered as a wonder fruit. India is the largest producer of aonla. It occupies an area of 93 thousand ha with a production of 1075 thousand metric tonnes.It is an indigenous plant and thrives well even with low care and management. The popularity for its health benefit is increasing day by day among the health conscious people. Anola cultivation may play as a key source of income in near future. But there are some major constraints. Not only the fruits but all the parts of the plant have significant and economic value. Emphasis on the collection and evaluation of performance of newly released cultivars of aonla under various agroclimatic zones. Research should be carried out for crop improvement to get better qualitative and quantitative traits. Development of efficient water use technology and proper regulation of irrigation should be done. Standardization of techniques for faster multiplication of planting material. Training and pruning should be standardized properly.

Key words: Constraints, new cultivars, training and pruning.

Introduction:

Among the indigenous fruit crops of Indian Subcontinent Aonla or Indian gooseberry (*Emblica officinalis*) is one of the prime member, specially known for its medicinal and therapeutic properties and also considered as a wonder fruit. It is very hardy and drought resistant fruit tree with a rare ability to withstand water stagnation also. The tree is found growing irrespective of plains and sub-mountain tracts throughout Indian subcontinent from 200 to 1500m altitude. India is the largest producer of aonla. It occupies an area of 93 thousand ha with a production of 1075 thousand metric tonnes (Horticultural Statistics at a Glance, 2018). Not only in India, naturally growing aonla trees are also found in different countries like Srilanka, Cuba, Bangladesh, USA (Hawaii and Florida), Iran, Iraq, Pakistan, China, Malaysia, Bhutan, Thailand, Vietnam, Phillipines, Trinidad, Panama and Japan. The major aonla growing states of India are Uttar Pradesh, Gujarat, Rajasthan, Tamil Nadu, Haryana, Maharashtra, Andhra Pradesh, Punjab, Karnataka and Himachal Pradesh. Uttar Pradesh ranks first in both area and production. Many medicinal values have been attributed to aonla for its higher Vit-C content. Regular use of a mixture of fresh aonla juice and honey forms an effective result to prevent diseases like- tuberculosis of lungs, asthma, bronchitis, jaundice, diarrhoea and also fever. Due to

the presence of high levels of super oxide dismutase, Aonla is having higher concentration of antioxidant with the free radical scavenging properties and effective in the treatment of peptic ulcer, dyspepsia, diabetes etc. Not only the fruits but all the parts of the plant have significant and economic value. The seeds and roots are also used in medicines. The bark leaves and fruits are used for tanning. The wood can be used for making furniture. The twigs are used for firewood.

Constraints in production:

It is an indigenous plant and thrives well even with low care and management. The popularity for its health benefit is increasing day by day among the health conscious people. Anola cultivation may play as a key source of income in near future. But there are some major constraints.

- **Cultivars:**

Generally the plat raised through seed, therefore exhibit great variability. However, few famous cultivars like Banarasi, Francis, Chakaiya are cultivated in Uttar Pradesh and Anand 1, Anand 2 and Anand 3 in Gujarat. But there are no standard cultivars for growing throughout India. Mostly the cultivars known are named on the basis of size colour and after the names of places, like- Green tinged, Red tinged, Pink tinged, Bansi Red and White-streaked, etc. Banarasi is a seedling selection from Varanasi district of Uttar Pradesh. The performance of the cultivars usually region specific, North Indian cultivars are not predictable under south Indian conditions and flowering shows erratic pattern. In fertile soils, some of the cultivars produce more of vegetative growth over yield.

Banarasi: The flesh of the fruits is moderately fibrous. The plant produces high number of male flowers and has self incompatibility; hence it is shy bearer. The cultivar is also mild susceptible to necrosis.

NA-4 (Krishna): The major constraint of NA-7 is brittleness of branches. Branches of the cultivar often break due to its own fruit load.

NA-10: Fruit skin of the cultivar rough, flesh is slightly fibrous and fruits are susceptible to necrosis.

Francis: Keeping quality of the cultivar is very poor and highly susceptible to fruit necrosis.

- **Planting Material:**

Plants raised from seeds are not true to type and shows a lot of variation in the progenies. Mostly they produce small sized fruits, inferior in quality. These trees have prolonged juvenile period. Genuine and quality planting material is not available in the market because most of the nurseries supplying the planting materials have not registered with the government. Soft woodgrafting shows 70% success at the site of terminal shoot ofthe rootstock raised *in situ*. For promising result seedling rootstocks should be raised *in situ* then graft with superior types of scion particularly in dry areas where mortality of budded plants is usually high. Shield budding

and patch budding are more popular among the different budding methods. Not only the propagation method but potting mixture, containers for transport and post- propagation handling should be standardized.

- **Young non-bearing orchard:**

Management of young non-bearing orchards is very essential because this stage has an important role in growth of the young plant and minimize juvenile period up to 3 years. It is also helpful to develop better frame work which will make a suitable canopy for the higher production throughout the life span of the tree. Newly planted young saplings should be properly nourished to promote better vegetative growth though after attaining the age of 2 years, the plant become ready for bearing few fruits. But it is advisable to remove the flowers and fruit of the first two years for getting better quality fruit and yield.

- **Young bearing orchard:**

At this stage (2-7 years), the tree keeps developing its canopy as well as produces fruits. Therefore, plant needs more nutrients to balance both vegetative and reproductive growths. It is more important because excessive vegetative growth adversely affects fruit setting, while excessive fruit load reduces proper development of tree canopy as well as leads limb breakage and also encourages fruit drop.

- **Training and Pruning:**

Aonla plant should be encouraged to form a shape of medium headed tree because the branches often break down due to heavy crop load and brittle nature of the wood. Heavy growth of water sprouts and rootstock growth also increase the chances of limb breaking under favourable environmental conditions.The main branches should not be allowed to appear at a height of 0.75 to 1.0 meter. Plants should be trained to modified central leader system.

- **Flowering, Pollination and Fruit Set:**

There are two types of flower, male and female which appear on branch lets mostly in late spring. Blowing hot winds is a major constraints of fruit set. Some cultivar like- NA 6 and NA7 have low sex ratio. The number of female and male flowers was found lowest in the branches present in the west direction. Poor flower set in some cases is observed due to staminate flowers. An increase in fruit set with hand pollination indicates the need of pollinating agents. BSR 1 does not need pollination, whereas some cultivars set fruits only when pollinizers are introduced. There has been no standardization of pollinizers for specific varieties till date. Therefore planting of mixed cultivars is recommended for better cross pollination resulting in better yields.

- **Flower and Fruit Drop:**

Flower and fruit drop is occurring in three phases. 70% of flowers drop within three weeks of flowering due to degeneration of the egg apparatus and lack of pollination. The second drop is observed from June to September due to lack of pollination and fertilization. In the third phase mainly fruits of various stages drop from third week of August to October due to physiological factors.

- **Pest, Diseases and Disorders:**

There are several pest, disease and disorder issue in aonla cultivation which must be deal with great care for getting profitable production. Bark eating caterpillar, shoot gall caterpillar, aphid and fruit sucking moths are important pests. Amla rust, blue mould, anthracnose and fruit rot are major diseases. Internal fruit necrosis and fruit drop are serious disorder.

- **Harvesting:**

Delayed harvesting results in heavy fruit dropping particularly in Francis and Banarasi. It also adversely affects the following years bearing. Harvesting should be done in the morning or in the evening. The best method of harvesting is hand picking of individual fruits. Individual fruits are plucked by climbing on the tree with the help of pegged bamboo or ladder. Once harvesting is over Amla become unavailable in the market throughout the year. Regulation of irrigation resulted in staggered harvest and Amla may available over a period of 10 months. Heavy crop loads sometimes makes harvesting difficult because of higher chance of physical damage.

- **Postharvest Handling and Storage:**

Till now a very little work on grading of aonla is reported. Fruits are graded into 3 grades i.e. large sized, small sized and blemished fruits. Aonla fruits can only be stored for 6-9 days at ambient temperature but with a salt solution it can be prolonged upto 75 days. Cut fruits can be stored for long time without loss of ascorbic acid if they are soaked with salt and ajowan solution and dried under sun. Neither such packaging technology has been standardized nor cold storage facilities are available.

- **Marketing:**

A proper market survey on the basis of demand and supply of Amla has not been done so far. The industrial tie up or buy back arrangement or contract farming is available very less. That's why farmers are not assured of a secure market. Above all middlemen are largely involved in the trade which makes very little benefit to growers.

Conclusion:

Work should be done on following aspects with high priority in order to stabilize the production in India:

- Emphasis on the collection and evaluation of performance of newly released cultivars of aonla under various agroclimatic zones.
- Research should be carried out for crop improvement to get better qualitative and quantitative traits.
- Development of efficient water use technology and proper regulation of irrigation should be done.
- Standardization of techniques for faster multiplication of planting material.
- Training and pruning should be standardized properly.

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BIOCHEMICAL SCREENING AND INHIBITORY EFFECT OF MARINE SPONGE, *MYCALE (ZYGOMYCALE) PARISHII* (BOWERBANK, 1875) ON PATHOGENIC MICROBES

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Abstract

To screen biochemical profile and antibacterial efficacy of *Mycale (Zygomycale) parishii* against human pathogenic bacteria and fungi has been studied.Crudeextractswere prepared using hexane, chloroform; acetone and methanol were tested against four bacterial strains, its revealed methanol and acetone strongly antibacterial activity against *Escherichia coli, Staphylococcus aureus, Salmonella typhi, Bacillus subtilis*and weak against chloroform and hexane. It exhibited antifungal activity against*Aspergillus* sp.,*Penicillium*sp., *Alternaria* sp., and *Fusarium* sp.by using agar well diffusion method. Biochemical screening determination acetone and methanol extract revealed strongly presence of alkaloids, tannins, flavonoids, proteins, steroids, carbohydrates, fats and weak in hexane and chloroform. More detailed study must be done for further isolation leading to the pure compounds.

Keywords: *Mycale (Zygomycale) parishii*, Pathogens, Antimicrobial activity, Biochemical analysis.

Introduction

Sponges, exclusively are aquatic and mostly marine, are found from the deepest oceans to the edge of the sea. Sponges (Phylum-porifera) are evolutionary ancient metazoans that have existed for 700-800 million years ago. They not only occur in the tropical oceans in great abundance, but also occur in temperate water and even in fresh waters (1) (2).Marine sponges are widely distributed from intertidal zones to thousands ofmeters deep in the ocean (3). A total of 486 species of sponges have been identified in India. In the Gulf of Mannar and Palk Bay a maximum of 275 species of sponges have been recorded. The distributions of sponges in other area are in Gulf of Kutch – 25 species; and Orissa coast – 54 species (4).Sponges (Porifera) are one of the richest sources of both biologically active secondary metabolites and chemical diversity (5) (6). Until now, more than 5000 different compounds have been isolated and identified from about 500 species of sponges (7) with nearly 800 of them exhibiting antibiotic activity (8). These natural products belonged to different class of compounds like terpenoids, alkaloids, macrolides, polyether's, nucleoside derivatives and peptides.

More recently attention has been directed to the search of bioactive peptides from sponges, being actually a well-established sector in the research of marine natural product. Antitumor studies were conducted with 19 marine natural products in a number of experimental and clinical models proved that sponges act as an excellent source for bioactive compounds (9).Recently, studies suggested that some bioactive compounds isolated from marine organisms have been shown to exhibit anticancer, anti-microbial, anti-fungal or anti-inflammatory and other pharmacological activities (10).So the aim of the study to screen out the antimicrobial effects and biochemical profile of the sponges collected from the south east coast of India.

Materials and Methods

Collection of sponges, sample preparation and extraction

The *Mycale (Zygomycale) parishii*marinesponge species were collected from the low inter tidal pools of Ratnagiri coast (16°55'N73°16'E), Maharashtra, India. The sponge collected was not harmful to an ecosystem.Identified sponge tissues samples were incised out and (100 g) were washed with sea water, air dried and chopped into small size and extracted with 200 ml methanol, Chloroform, Acetone and Hexane for about 15 days.After 15 days the extract was filtered through Whatmann filter paper (No: 2) and Solvents were removed by rotary vacuum evaporator (Buchi typeSuperfit, Bangalore)) under reduced pressure so as to get the crude sponge extract. The concentrated extract was used for antimicrobial study.

Antimicrobial activity

For the antimicrobial screening 4 species of bacterial and 4species of fungal were selected. The bacterial and fungal strains were obtained from Government Institute of Science, Aurangabad,(MS) India. *Escherichia coli, Salmonella typhi,* (Gram negative bacteria) *Bacillus subtilis, Staphylococcus aureus,* (Gram positive bacteria) strains were used. *Aspergillus*sp.,*Penicillium*sp.,*Alternaria* sp. and*Fusarium* sp.were used as fungal test microorganisms.

Antibacterial activity of well assay method

Assays were performed according to the standard guidelines of the National Committee for Clinical Laboratory Standards (11) (12)using a modified Kirby–Bauer well assay method. All bacteria were stored at -20°Cuntil use. Cells were grownin Muller Hinton brothand were transfer to Muller Hinton agar. Broth cultures were swabbed onto agar medium to achieve a lawn of confluent bacterial growth separately for each strain. A sterile stainless steel borer (6 mm) was used to make well in the medium. Five wells were bored in each plate. The sponge extract 100 µg/ml was loaded in to the well and to find out the inhibitory potential.Discs of Streptomycin (25µg/ml) were used as positive control. The plates were incubated at 37℃ for24 hrs. The growth of bacteriaaround each well was observed carefully and the diameter of the zone of inhibition around each well was measured using a Hi-media zone reader Triplicate plates were maintained for each test.

Antifungal activity of well assay method

Assays were performed according to the standard guidelines of the National Committee for Clinical Laboratory Standards (11) (12) using a modified Kirby–Bauer well assay method. All fungi were stored at －20°Cuntil use. Cells were transfer to Sabouraud dextrose. The fungal cultures were maintained in 0.2% Sabourauddextrose medium. Each fungal inoculum was applied on plate and evenly spread on Sabouraud dextrose agar using a sterile cotton swab.A sterile stainless steel borer (6 mm) was used to make well in the medium. Five wells were bored in each plate. The sponge extract 100 µg/ml was loaded in to the well and to find out the inhibitory potential. Discs of the Fluconazole were used as the positive control. The plates were incubated at 28℃ for 48 hrs. The growth of fungi around each well was observed carefully and the diameter of the zone of inhibition around each well was measured using a Hi-media zone reader Triplicate plates were maintained for each test.

Preliminary screening of sponges for chemical constituents

Qualitative analysis of the chemicals present was carried out using methods described by (13). The freshly prepared sponge extracts were analysed for the presence of various constituents as described by Okawori et al (2008).

1. **Detection of alkaloids**

i. **Mayer's Test:**Extracts were treated with Mayer's reagent (Potassium Mercuric Iodide). Formation of a yellow coloured precipitate indicates the presence of alkaloids.

ii. **Wagner's Test:** Extracts were treated with Wagner's reagent (Iodine in Potassium Iodide). Formation of brown/reddish precipitate indicates the presence of alkaloids.

iii. **Dragendroff's Test:**Extracts were treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Formation of red precipitate indicates the presence of alkaloids.

iv. **Hager's Test:**Extracts were treated with Hager's reagent (saturated picric acid solution). Presence of alkaloids confirmed by the formation of yellow coloured precipitate.

2. **Detection of glycosides**

Legal's Test: Extracts were treated with sodium nitropruside in pyridine and sodium hydroxide. Formation of pink to blood red colour indicates the presence of cardiac glycosides.

3. **Detection of tannins**

i. **Gelatin Test:**To the extract, 1% gelatin solution containing sodium chloride was added. Formation of white precipitate indicates the presence of tannins.

ii. **Ferric Chloride Test*:*** With 1% ferric chloride solution the extract gives blue, green, or brownish green colour indicating the presence of tannins.

4. **Detection of flavonoids**

i. **Alkaline Reagent Test:**Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute acid, indicates the presence of flavonoids.

ii. **Lead acetate Test:**Extracts were treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of flavonoids.

iii. **Shinoda Test:**2-3 ml of extract, a piece of magnesium ribbon and 1 ml of conc. hydrochloric acid was added. Pink or red coloration of the solution indicates the presence of flavonoids.

iv. **Zinc Hydrochloride Test:**To the test solution, add a mixture of zinc dust and conc. Hydrochloric acid. It gives red colour after few minutes.

5. **Detection of proteins and amino acids**

i. **Xanthoproteic Test:**The extracts were treated with few drops of conc. Nitric acid. Formation of yellow colour indicates the presence of proteins.

ii. **Ninhydrin Test:**To the extract, 0.25% w/v ninhydrin reagent was added and boiled for few minutes. Formation of blue colour indicates the presence of amino acid.

6. **Detection of saponins**

Foam Test:0.5 gm of extract was shaken with 2 ml of water. If foam produced persists for ten minutes it indicates the presence of saponins.

7. **Sterols and Terpenoids**

Salkowski's Test: Extracts were treated with few drops of Conc. Sulphuric acid, Red colour at the lower layer indicates presence of steroids and formation of yellow colour at the lower layer indicates the presence of terpenoids.

8. **Detection of carbohydrates**

i. **Molisch's Test*:*** Filtrates were treated with 2 drops of alcoholic α-naphthol solution in a test tube. Formation of the violet ring at the junction indicates the presence of Carbohydrates.

ii. **Benedict's Test:**Filtrates were treated with Benedict's reagent and heated gently. Orange red precipitate indicates the presence of reducing sugars.

iii. **Fehling's Test:**Filtrates were hydrolysed with dil. HCl, neutralized with alkali and heated with Fehling's A and B solutions. Formation of red precipitate indicates the presence of reducing sugars.

iv. ***Selwanoffs Test:*** One half ml of a sample solution is placed in a test tube. 2 ml of selwinoffs reagent (a solution of resorcinol and HCL) is added. The solution is then heated in a boiling water bath for two minutes. A positive test is indicated by the formation of a red product.

v. **Camnelisation Test:**1 ml extract were treated with strong sulphuric acid gives a burning sugar smell. This indicates the presence of carbohydrates.

9. **Fats and Fixed Oils**

Stain Test: Small amount of extract were pressed between two filter papers. An oily stain on filter paper indicates the presence of fixed oil.

Results and Discussion

Table.1 showed the results of the in vitro testing of sponge extracts against pathogenic bacteria. This can be observed from theemergence of clear zone around the agar well. Clear zone aroundthe agar well indicates that the absence of bacteria that can growafter incubation due to the antibacterial compounds in the area.Methanol and acetone extracts showed strongly positive antibacterial activity against *Escherichia coli, Staphylococcus aureus, Salmonella typhi, Bacillus subtilis*and weak activity against chloroform and hexane. In Table.2 Methanol and acetone extracts showed strongly positive antifungal activity against *Aspergillus* sp.,*Pencillium*sp., *Alternaria* sp., and *Fusarium* sp.and positive activity against chloroform and hexane. These differences in activities are due to diverse chemistry ofbioactive compounds in the same sponges.

Table.3 showedpreliminary biochemical screening determination by some chemical tests.These tests were carried out by using hexane, chloroform, acetone and methanol extracts. The hexane and chloroform extract revealed the presence of alkaloids, steroids, carbohydrates,

fats and fixed oil and absence of glycosides and tannins, flavonoids, proteins and amino acids. The acetone and methanol extract contain alkaloids, tannins, flavonoids, proteins and amino acids, steroids, carbohydrates, fats and fixed oils. More detailed study must be done for further isolation leading to the pure compounds.Sponges are primitivemarine invertebrates which contain more natural products thanany other marine phylum. Many of their products have strongbioactivities including anticancer, antimicrobial, larvicidal,hemolytic and anti-inflammatory activities and are often applicable for medical use (14).

Various studies have been done on anti–microbial properties of the bacteria associated with the sponges. The antibiotics produce by these bacteria ranged from broad spectral to species specific (15). The discovery of new classes of antibiotics is necessary due to the increased incidence of multiple resistances among pathogenic microorganisms to drugs that are currently in clinical use (16).Marine sponges have been shown to produce many natural bioactive agents, including alkenes, and many of the sponge-derived compounds that have entered clinical and pre-clinical development are believed to be ultimately microbial in origin (17).Sponges ofthe class Demospongiae are known to produce the largest numberand diversity of secondary metabolites isolated from marineinvertebrates, most of them with medically relevant biologicalactivities and important ecological roles (18). Thetoxicity of sponges has been well-documented, which could beascribed to the diverse and potent cytotoxic compounds (19).The antitumour activity of cell free extracts from sponge associateactinomycetes might be due to the presence of the active secondary metabolites alkaloids and guninine(20).

Table No. 1: Antibacterial activity of crude extract of marine sponge organism *Mycale (Zygomycale) parishii*

Organic solvents	Pathogenic **Bacteria**			
	Escherichia coli	***Staphylococcus aureus***	***Salmonella typhi***	***Bacillus subtilis***
Methanol	++	++	++	++
Acetone	++	++	++	+
Hexane	+	+	+	+
Chloroform	+	+	+	+

(-) No activity, (+) Positive 1–3mm halo, (++) Strongly Positive 3–7-mm halo.

Table no. 2: Antifungal activity of crude extract of marine sponge *Mycale (Zygomycale) parishii*

Organic solvents	Pathogenic Fungi			
	Aspergillus spp.	*Penicillium* spp.	*Alternaria* spp.	*Fusarium* spp.
Methanol	++	++	++	++
Acetone	+	++	++	++
Hexane	+	+	+	++
Chloroform	+	+	+	++

(-) No activity, (+) Positive 1–3mm halo, (++) Strongly Positive 3–7-mm halo.

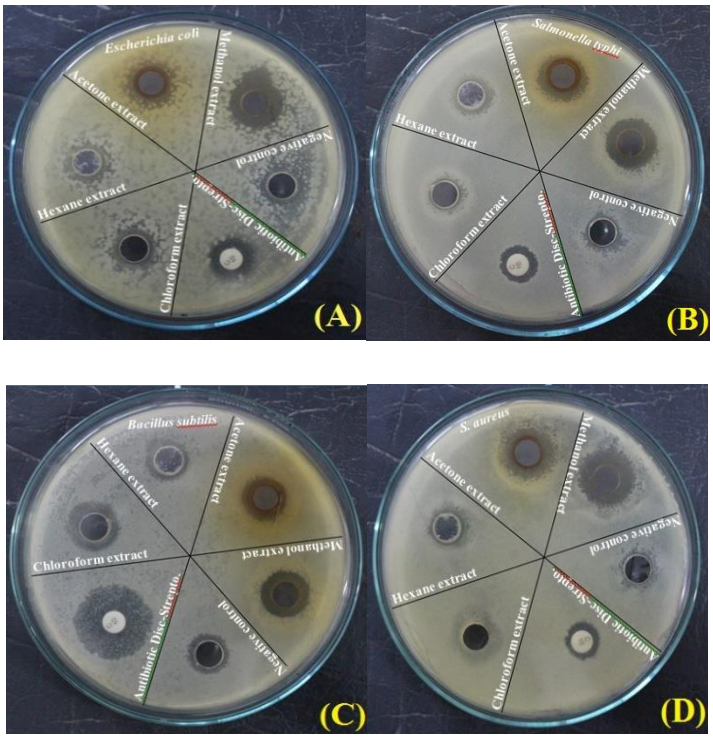

Fig.1. Antibacterial activity *A) Escherichia coli, B) Staphylococcus aureus,C) Salmonella typhi, and D) Bacillus subtilis*

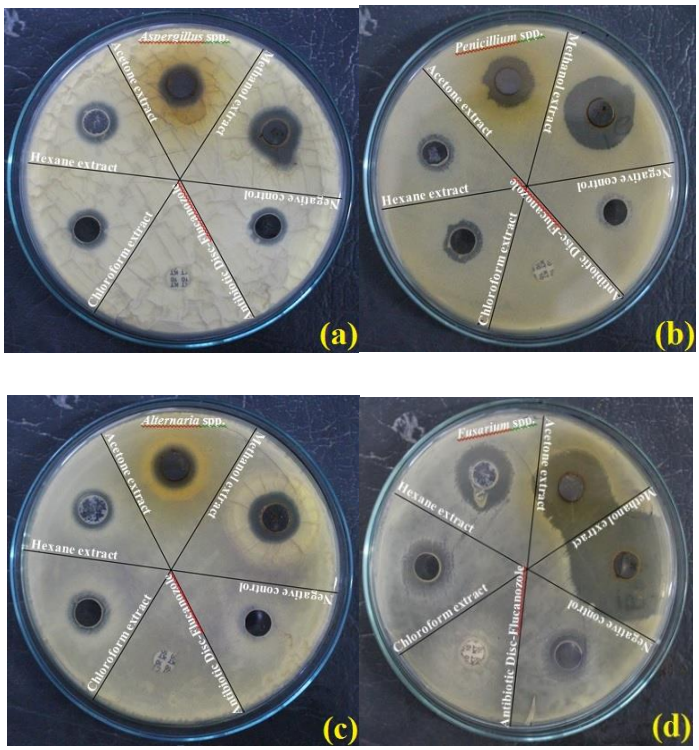

Fig.2. Antifungal activity: *a) Aspergillus sp., b) Penicillium sp., c) Alternaria sp., and d) Fusarium sp.*

Table no. 3: Preliminary biochemical screening of crude extract of marine sponge *Mycale (Zygomycale) parishii*

Bio-chemicals		Hexane	Chloroform	Acetone	Methanol
Alkaloids	Mayer's Test	-	-	+	-
	Dragendrorff's Test	+	+	++	+
	Wagner's Test	+	++	++	++
	Hager's Test	+	+	-	++
Glycosides	Kedde Test	-	-	-	-
	Legal's Test	-	-	-	-
Tannins	Gelatin Test	-	-	-	+
	Ferric Chloride Test	-	-	-	-
	Shinoda Test	-	-	+	-

	Zinc Hydrochloride Test	-	-	+	-
Flavonoids	Lead Acetate Test	-	-	+	+
	Alkaline Reagent Test	-	-	-	+
Proteins and Amino acids	Xanthoproteic Test	-	-	-	-
	Ninhydrin Test	-	-	+	-
Sterols and Terpenoids	Salkowski Test	+	+	+	+
	Molisch's Test	-	-	-	-
	Benedict's Test	-	-	-	-
	Camnelisation Test	+	+	++	+
	Selwinoff's Test	-	-	+	-
Carbohydrates	Fehling's Test	-	-	+	-
Fats and Fixed Oils	Stain Test	+	+	++	+

(-) No activity, (+) Positive, (++) Strongly Positive

Conclusion

The main focus of the study reveals that the marine sponges*Mycale (Zygomycale) parishii*shows the potential source for the antimicrobial and biochemical efficacy.Itcontain bio-constituents like alkaloids, glycosides, tannins, flavonoids, proteins and amino acids, steroids, carbohydrate, fats and fixed oil. More detailed study must be done for further isolation leading to the pure compounds.

Acknowledgement

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Nutraceutical Advantages of different Indian Spices: A Review

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Abstract

Spices are natural food additives which have been used as flavor enhancers and color agents, and as preservatives for 1000 of years. Spices are historically used as diet aides to improve the sensual excellence of food which have been recognized for their beneficial physiological effects on human health in traditional medicine systems. Spices contribute significantly to human health by supplying bioactive, and can be considered the first ever usable food. Spices also have much-reaching nutraceutical significance in their hypocholesterolemic and antioxidant properties. The effects of oxidative stress inhibition on the production of degenerative diseases has been consider, such as cardiovascular diseases, inflammatory diseases and cancer, neurodegenerative diseases. The antioxidant properties of active compounds found in spices are of specific interest. While adding to our everyday diet in terms of taste, colour and fragrance, spices take elongated known as having physical properties that are expected to support anthropological well-being. Such research reported digestive stimulant action, hypolipidemic influence, antidiabetic effects, antioxidant capacity, anti-inflammatory properties, antimutagenic and spice ability. Among these, a not enough different spices take extensive nutraceutical interest in their hypocholesterolemic and antioxidant properties. Such positive physiological effects in a number of disease conditions often have the potential for future therapeutic use. This study offers an analysis of scientific evidence for the spice's nutraceutical ability. Such positive physiological effects in a number of disease conditions often have the potential for future therapeutic use.

Introduction

Spices provide a long tradition of cooking, nutritional and preservative use. In ancient Egyptian papyrus the use of coriander, fennel, juniper, cumin, garlic and thyme is documented 1555 BCE (Bellamy and Pfizer, 1992). Spices are a group of exotic food adjuncts that have been used for centuries to improve the food's sensory quality, especially the volume and variety of consumption in tropical regions (Saranraj *et al.*, 2019). These spices additives provide characteristic texture, taste, or flavor and spiciness to the cooking. Some spices, like fenugreek, can also enhance the taste of the dish. It's a growing sight of their distinct Fragrance that increases the hunger. However, some spices has long been regarded as having antimicrobial benefits such as tonic, carminative, antispasmodic stomach and anthelmintic (Nadkarni and Nadkarni, 1976) Although these observations are primarily empirical, these extremely positive characteristics have won them medicinal applications within the indigenous medicine network not just in India as well as in other countries. Spices are a complex group with a broad number with staple food ingredients used in tropical, eastern, Hispanic and Mediterranean regions across the globe (Kochhar, 1996). Some nutraceutical properties and health benefits of spices are mentioned in Table 1 and Figure 1.

Health benefits of spices

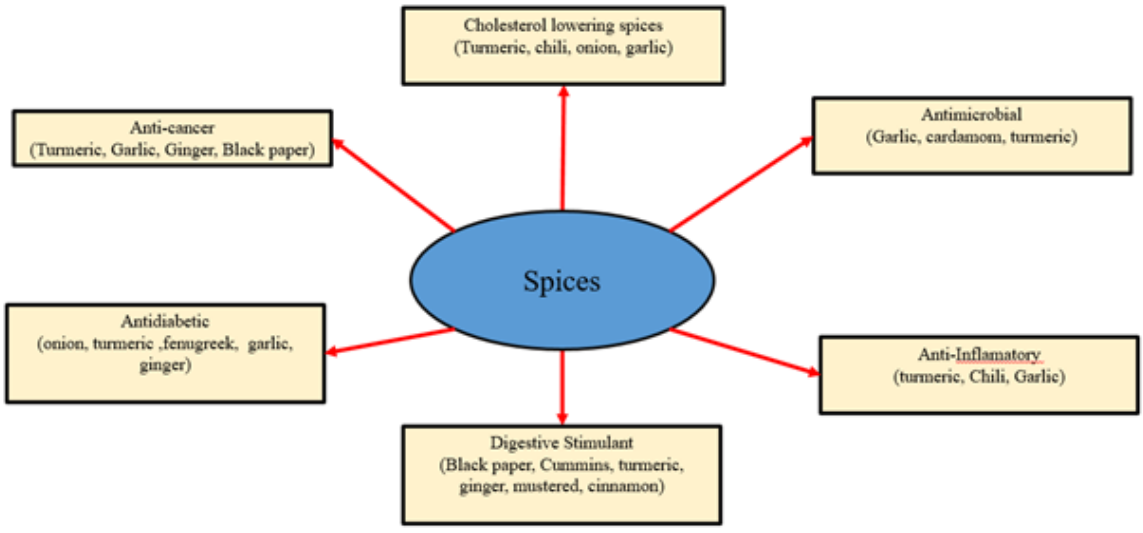

Figure 1. Different health benefits of spices.

Cardiovascular disease

The use of garlic or garlic oil was linked to reduce in the overall cholesterol, low density lipoprotein cholesterol (sun, 2018). Research shows that a daily consumption of between half and one garlic clove decreases cholesterol by 9 per cent (Gore and Dalen, 1994). The numbers of different research studies examine the influence of garlic on the cardiovascular risk factors other than low density lipoprotein and cholesterol levels. Anticlotting effects were correlated with garlic extracts as well as moderate blood pressure decreases (about 5.5 per cent decrease in systolic pressure). Herbs and spices play an essential part in the food consumption of flavonoids. Garlic, licorice, cinnamon, coriander, ginger, and thyme have a high flavonoid presence but, aside from observational studies reports, there is no evidence that suggests significant long term health advantages from these spices.

Anti-Cancer

There is no evidence that still spices include an ant carcinogenic effect in humans, although some in-vitro trials and in-vivo mammal tests suggest that certain herbs and spices might have a chemo-preventive effect on early cancer infections. Spices may function by providing defense against cancer through several mechanisms (capinova *et al.*, 2017). It has been shown that certain herbal phytochemicals or herbal extracts inhibit one or more cancer process stages. Inhibition of phase I (activation of procarcinogen) and induction of phase II (deactivation of carcinogen) metabolic enzymes by herbal products may account for some of the preventive effects against gene induction or chromosomal mutations that may cause cancer.

Digestive Stimulant Action

Spices are defined for increasing gastric efficiency(Kaefer and Milner, 2011). They are generally believed to improve the saliva production and the production of gastric juice, and thereby assist with metabolism. Turmeric has both the ability of raising a gastric juice's cumin production. Ingredients for commercial digestive substances and natural remedies for digestive problems such as flatulence, indigestion and intestinal problems are additives such as cinnamon, pepper, ajowan, cumin, rosemary, cilantro and garlic. Previous studies on the digestive mechanism of

spices are mainly qualitative; only in recent times has such an advantageous characteristic of spices been available (Platel and Srinivasan, 2004).

Antioxidant property

Spices have even been researched in food production for at least 55 years for their antioxidant thcecontent, but almost 25 years have gone by since the role of antioxidants in preserving biological processes from oxidant harm has been recognized. In disease pathways such as coronary vascular disease (CVD), autoimmune, cancerous, and elderly diseases, cellular or subcellular oxidative damage is often seen as a significant phenomenon. The reactive oxygen radicals are harmful to bodies at both membranes and molecular levels (sanderson *et al.,* 2013).

Anti-inflammatory property

With increasing interest in the treatment of chronic inflammation through alternatives to non-steroidal anti-inflammatory drugs, the use of food-based approaches is emerging. Lipid peroxides are important in arthritis and other inflammatory diseases. Turmeric happens to be the earliest anti-inflammatory drug found in India's indigenous medicine system. Natural anti-inflammatory spice compounds (curcumin, capsaicin, gingerol) tend to work by inhibiting one or more of the steps linking pro-inflammatory stimuli to COX activation, Spices: the Exilir of Life/39 such as blocking the translocation of NFkB into the nucleus by curcumin. That has recently been shown to be as effective in inhibiting aberrant crypt foci in rats as indomethacin (a non-steroidal anti-inflammatory drug) in natural anti-inflammatory compounds such as curcumin (Kunnumakkara*et al.,* 2017;Mustafa *et al.,* 2019).

Table1: Spices with nutraceutical properties and health benefits.

Spice	**Nutraceutical and Health benefits of spices**	**reference**
Ginger	Antioxidant and Anti-Inflammatory	Mustafa *et al.*, 2019
Turmeric	Anti-cancerous, anti-inflammatory, anti-viral, anti-bacterial, healthy skin, laxative, good for affective of liver.	Kunnumakkara*et al.*, 2017
Garlic	Hypocholesterolemic, antiflatuelent,	Srinivasan*et al.*, 2014

Red pepper	Digestive stimulant action, Anti-Inflammatory, pain relief useful in indigestion.	Platel and Shrinivasan, 2004
Cumin	**Antioxidant effect,Digestive stimulant action, Antidiabetic effects, Anti-inflammatory effects, Cardio-protective influence through hypolipidemic and hypotensive effects.**	Srinivasan, 2018.
Fenugreek	Antidiabetic, Anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activities.	Wani and kumar, 2018
Cardamom	Antibacterial, antiviral, Digestive stimulant action, Anti-inflammatory effects.	Asghar *et al.*, 2017
fennel	Antioxidant, cytotoxic, and antitumor activities.anticarcinogenic.	Mohamad *et al.*, 2011
cumin	antiallergic, antioxidant, anti-platelet aggregation, and hypoglycemic.	Sowbhagya, 2013
mustard	Antioxidant and Anti-Inflammatory	Rodríguez and Aznar, 2020
Red chili	hypotriglyceridemic, hypocholesterolemic, anti-inflammatory and anticancer	Joseph *et al.*, 2020

Conclusion

The capacity of spices to affect factors related to cancer protection pathways gives important leads that can drive approaches for human chemoprevention. For a number of disease conditions, many of the called physiological properties of spices have the potential for future therapeutic application. Liberal spice intake is not only proven healthy, but may also have advantageous special effects on the antioxidant position. This is not possible to rule out the efficacy of lower doses of these spices although it is not experimentally recorded. Since each spice has many more than one advantageous nutrition property and, in their practice, there is still a chance of interaction among them, a spicy diet is likely to create life more "spicy" and safer. Throughout the past few decades, several beneficial health properties of these specific food adjuncts have been experimentally demonstrated, including: digestive stimulant activity, anti-atherogenic and cardio protective ability, spices: antilithogenic property of Exilir of Life/45, antidiabetic effect, anti-inflammatory property, and cancer preventive capacity.

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Emblica officinalis (Amla): A multipurpose medicinal tree

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Abstract

The gift to humanity to acquire a balanced lifestyle is medicinal plants, of great elementary and therapeutic value. commonly referred to as Indian gooseberry or Amla, Emblica officinalis. In an entirely indigenous traditional form of medicine, it has superior importance. The excerpts from the different sections of E. There are numerous phytoconstituents, viz. officinalis, especially fruit. Polyphenols such as gallic acid, ellagic acid, various tannins, minerals, vitamins, amino acids, fixed oils, and flavonoids such as quercetin and rutin are higher. It is known that the extract or plant is effective against diversified diseases such as inflammation, cancer, osteoporosis, neurological disorders, hypertension, lifestyle diseases, parasitic and other infectious disorders.

Keywords: Amla, antioxidant, disease, phytochemical.

Introduction

Indian gooseberry is commonly known as *Emblica officinalis*. Amla has been commonly used in Ayurveda, both for edible (tonic) plants and for its therapeutic ability. Amla is highly nutritious, and vitamin C, minerals and amino acids are reported as an essential dietary source. Amla includes phytochemicals such as solid oils, phosphatides, essential oils, tannins, minerals, vitamins, amino acids, glycosides, fatty acids, etc. Different medicinal capabilities of Amla, including antimicrobial, antioxidant, anti-inflammatory, analgesic and antipyretic, adaptogenic, hepatoprotective, anti-tumor and anti-ulcer activity, have been previously reported, either in combination or in Amla alone.

Amla is highly nutritious and vitamin C, minerals and amino acids are reported as an essential dietary source. Amla includes phytochemicals such as solid oils, phosphatides, essential oils, tannins, minerals, vitamins, amino acids, glycosides, fatty acids, etc. Different medicinal capabilities of Amla, including antimicrobial, antioxidant, anti-inflammatory, analgesic and antipyretic, adaptogenic, hepatoprotective, anti-tumor and anti-ulcer activity, have been previously reported, either in combination or in Amla alone. It is known as Amla and Aonla in Hindi (Bhandari *et al.* 2012).

Botanical Description

Amla is a tree with a greenish-grey bark and greenish-yellow flowers, small to moderate in number, produced in axillary clusters. Alternate branchlets are superimposed and all face each other in one plane. The length of the branchlets is up to 40 cm, and the branchlets contain more than 100 leaves. Barks are brown in colour, peeling into an irregular tiny flake. A misleading impression of finely pinnate foliage is provided by the miniature, oblong leaves, only 3 mm wide and 1.25–2 cm long, distichously disposed on branchlets. The feathery leaves, with a rounded base and an obtuse or acute apex, are linear-oblong. It has axillary cymes, densely fascicled, sometimes on the naked portion below the leaves, along the leaf bearing branchlets. The arms of the style are dichotomously bifid, smooth and re-curved greenish, and puberulus sparse. The arms are about 5–7 mm long from the tip of the ovary. The diameter of the fruit varies from 1.8 to 2.5 cm. Groove marks are very shallow around the septa. The tender fruits are green, fleshy, globose and bright, and when ripe, they change to light yellow or brick-red (Krishaveni *et al.* 2010).

Antioxidant Effect

The antioxidant and free radical scavenging function of Amla has previously been studied by several researchers and the key explanation behind it is Amla's ascorbic acid, tannins and polyphenolic components. Ntioxidant efficacy against many free radicals is stated for various Amla extracts and phytoconstituents, such as 1,1-Diphenyl-2-picrylhydrazyl radical (DPPH) free radicals, superoxide, nitric oxide, iron (III) reduction, 5,5-dimethyl-1-pyrroline-N-oxide, etc.

Anti diabetic Effect - The hydro-methanolic extract of Amla leaves effectively normalises the dose-dependent impairment of antioxidant status in streptozotocin-induced diabetes relative to glibenclamide. By scavenging the free radicals and reducing the possibility of diabetic complications, the extract had rapid protective effects against lipid peroxidation (Muriel *et al.* 2008).

Phytochemistry

The most abundant components of Amla's fruit are ascorbic acid (vitamin C). In addition, other phytochemicals extracted from this plant include fixed oils, phosphatides, essential oils, tannins, minerals, vitamins, amino acids, fatty acids, glycosides, etc. Linolenic, linoleic, oleic, stearic, palmitic and myristic acids are identified from P. emblica as fatty acids. Sugars are metabolites of D-glucose, D-fructose, D-myo-inositol, D-galacturonic acid, D-arabinosyI, D-rhamnosyl, D-xylosyI, D-glucosyI, D-mannosyl and D-galactosyI. The major tannins reported from this plant are Emblicanin A and Emblicanin B, pedunculagin and punigluconin. Gallic acid, amlaic acid, arginine, aspartic acid, astragallin, beta-carotene, beta-sitosterol, chebulagic acid, chebulagic acid, chebulagic acid, chebulagic acid, corilagic acid, corilagin, cysteine, ellagic acid, emblicol, gibberellin, glutamic acid, glycine, histidine, isoleucine, kaempferol, leucodelphinidin, methylic acid, glycine, gibberellin, isoleucine, kaempferol, leucodelphinidin, methylic acid are other compounds isolated from this plant (Chakroborty *et al.* 2009).

Ethnomedicinal Uses

Ethno-pharmacological uses: If the selection of plants is made on the basis of their conventional use, the likelihood of success in research is higher. This herb has been used for more than 3000 years in traditional medicine.

Due to its usefulness in the area of gastrointestinal disorders, the Amla herb has found its common applications in many health problems.

It is used as a galactagogue in many female disorders, such as leucorrhoea, menorrhagia and mammary abscess. The ability of fresh leaf paste to treat white spots on the skin, diabetes, and jaundice. For urinary disorders, liver disease, dyspepsia, anorexia, constipation and dysentery, whole plant extract is used. A decoction of the leaves, sugar and cumin seeds will treat gonorrhoea and syphilis. Amarus whole plant extract has been effective in the treatment of malaria.

It is an ingredient of Ayurveda-most Chyawanprash's common formulations, consumed on a large scale not only in India, but also worldwide due to its anti-inflammatory activity (Rout *et al.* 2020).

Amla is an important herbal medicine used in the Unani and Ayurvedic medicine systems. The fruits of Amla have been used in traditional Indian medicine for the treatment of many diseases for thousands of years. For medicinal purposes, all parts of the plant are used, especially the fruit. It is used for the therapy of diarrhoea, jaundice, and inflammation in conventional medicine. Sour, astringent, bitter, acrid, sweet, cooling, anodyne, ophthalmic, carminative, digestive, gastric, laxative, aphrodisiac, rejuvenating, diuretic, antipyretic and tonic are the fruits. They are useful in the treatment of diabetes, cough, asthma, bronchitis, cephalalgia, ophthalmopathy, dyspepsia, diuretic, anaemia, bilious, hyperacidity, peptic ulcer, erysipelas, skin disease, leprosy, haematogenesis, inflammation, anaemia, emaciation, hepatopathy, jaundice, alienation, dysentery, haemorrhage, leucorrhoea, menorrhagia, heart disease, sporadic fever, and cardiac disorders. In addition, to relieve headaches and dizziness, snakebite and scorpion-sting, the pulp of the fruit is smeared on the head. Fruits are considered to be a rich source of vitamin C and are also used in the manufacture of pickles, preserves and jellies. The leaves are used in aphrodisiac, antipyretic, bilious, asthma, bronchitis, and vomiting applications. Cooling, diuretics and laxatives are the unripe berries. Exudation from the incisions on the fruit is used in inflammation of the eye as an external application. In gonorrhoea, fresh bark juice is administered with honey and turmeric. Decoction of the roots in myalgia following any febrile condition has occurred (Baliga *et al.* 2011).

Conclusion

Because of its diverse pharmacological properties, Amla is one of the most used Ayurvedic medicinal plants to treat many human ailments. However, its anti-inflammatory and antioxidant properties are its most remarkable features. Different pharmacological effects of Amla were scientifically studied, indicating the clinical significance of this plant species. The conventional use of Amla enforces its impact on almost all human diseases, but very few of them have been confirmed by clinical trials and the vast majority of these typical applications have yet to be

demonstrated by systematic research. In future research, Amla may serve as a diverse subject for the research and development of alternative and complementary medicine. Different possible treatments can be discovered from the fruit of this plant on the basis of its conventional uses, indicating that it serves as the natural source for the creation of future medicines.

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Strategies for Water logging Tolerance in Wheat Scenario of Climate Change

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ABSTRACT

Wheat (*Triticum aestivum*) (2n=42) is the world's population in the agricultural field, occupying 22% of the cultivated area. Approximately 25 species recognised in the world, 3 species namely, T. T.durum (Macroni wheat), aestivum/vulgare (Bread wheat), & T. Commercially cultivated in India, dicoccum (Emmer wheat). Climate change (temperature, pressure, humidity, drought, high rain fall, global warming, etc.), cyclone, soil condition (physical, chemical, electrochemical and biological properties, PH, nutrient, etc.) have produced complex challenges faced by agriculture. In the year 2019-20, wheat production was reported globally at ~ 106.2 million tonnes. Here we address some of the problems of how plants thrive in stressful environments when high rainfall or water logging conditions alter the environment. Water logging annually affects vast areas of farmland worldwide as a result of heavy rainfall irrigation soil runoff. In wheat, ~15-20% of annual crops suffer losses in yield due to water logging. The major problem for farmers in high rainfall regions in India and other countries is water logging. In terms of hypoxia (O2 deficiency) or anoxia, the plants growing in the water logging soil face a stressful climate (absence of O2). For some morphologically and metabolically adaptation, wheat plants attempt to render themselves water resistance during the intense rainy season or water logging floods. Formation of aeranchyma in adventitious roots, changes in aerobic breathing to anaerobic breathing, producing auxin and ethylene hormone for root shoot elongation. Some of the resistance varieties, which produce high grain yield, are produced by many plant breeders. The presence of Adhgene in wheat, also present in barley and rice, is correlated with the resistance of water logging.

Keywords: Anoxia, climate change, hypoxia waterlogging tolerance, wheat.

Introduction:

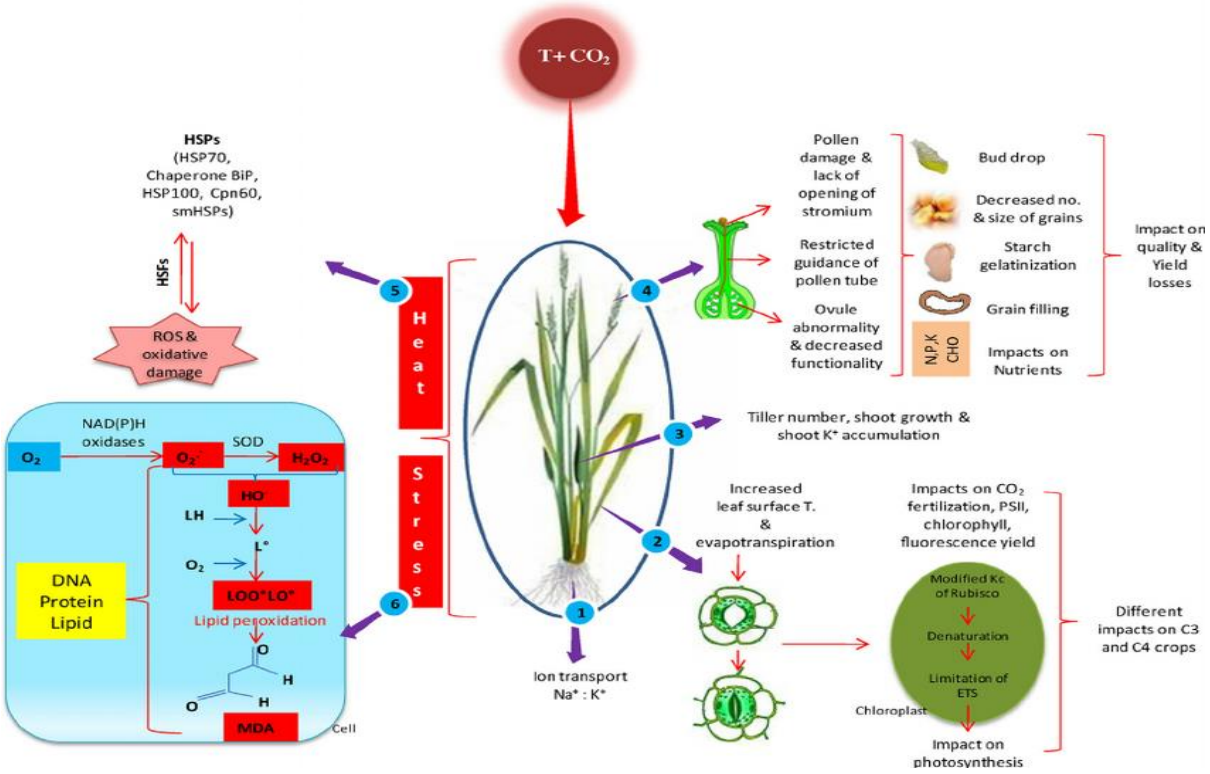
Agriculture is a key part of the Indian economy and provides most of the Indian population with food and livelihood activities. The agricultural sector accounts for 35% of the Gross National Product (GNP) of India and, as such, plays a crucial role in the growth of the country. (2002 FAO)

For a large proportion of the population of the planet, wheat is a staple crop. Wheat is rich in carbohydrates, protein and essential minerals and vitamins, such as vitamins B and E, fibre, calcium and iron. It is the most widely cultivated crop in the world, consuming 22 percent of the cultivated area. It is the main crop in the USA, Canada and Asia, and it is not well suited to tropical and subtropical conditions as a C3 crop. Just three species, namely *T.aestivum*/vulgare (Bread wheat), *T. durum* (Macroni wheat) are recognised as 25 species worldwide. Commercially grown in India, dicoccum (Emmer wheat) The Indian Ministry of Agriculture released its grain production forecasts for the 2019/20 season, which is expected to produce a record 106.2 million tonnes of wheat. This compares to the 103.6 million tonnes produced in 2018/19, the first time that the production barrier of 100 million tonnes was violated (Laskowski *et al.* 2019)

The patterns shown by Indian scientists for rising temperatures, heat waves, droughts and floods, and sea level are in line with the Inter-Governmental Panel on Climate Change (IPCC), although the extent of changes could vary. The average temperature in India is projected to rise during the rabi (November to March) season to 1.7 º C in Kharif (July to October) and up to 3.2 o C, while the average rainfall is expected to increase by 10 per cent by 2070. Cases of destructive and recurring floods in the north-eastern states during 2002, 2003 and 2004; a record of 944 mm of rainfall per day in Mumbai during 2005 resulting in losses of Rs 1000 crore and 1000 lives; devastating floods in Surat, Barmer and Srinagar during the 2006 monsoon season; droughts in 2000 and 2002 affecting almost 11 million people in Orissa and droughts in 2006. During 2009, more than 5.7 million hectares of rice cultivation were affected by the late arrival of monsoons and irregular rainfall, and 262 districts were declared affected by drought. With a 68 percent rainfall deficit, western Uttar Pradesh was the worst to be affected. The eastern part of the country (Bihar, Jharkhand and West Bengal) faced an extreme drought in 2010, when northern India received a very good amount of monsoon rain. 2010 has also been the hottest year since the start of temperature measurements. Evidence of weather aberrations suggesting climatic risks are rising temperatures, rainfall deficits and the occurrence of droughts, especially in non-conventional pockets.

In addition to the interplay of other abiotic and biotic variables, agriculture, particularly in India with nearly 60% rainfed area, has been a highly risky venture with monsoon vagaries. Climate change is designed to compound the overwhelming and dynamic problems that agriculture is already facing. Therefore, in order to reduce the vulnerability of Indian agriculture to the adverse effects of climate change and to make it more robust, concerted efforts need training and adaptation (Bhagawati *et al.*2017).

Climate Change and Agriculture



Sources- Tripathi *et al.*2015

The agronomic characteristics of conventional crops have also been influenced by extreme temperature, light intensity, photoperiod and relative humidity changes (Yang *et al*. 2013). Over the years, many conventional crops have been replaced by high yielding crops with a steady reduction in yield coupled with irregularities in weather patterns. This was despite the fact that our typical crops were more appropriate for harsh climatic conditions. Some reasons are the lack of coordinated production and supply of improved seed varieties, evolving food preferences, time-consuming and inefficient food preparation procedures for almost all conventional crops.

Mixed cropping, rotational cropping and double cropping varieties may bring climate resilience and enhance soil fertility when India is reeling under drought and adverse climate conditions. Crops have been significantly affected by changes in climatic conditions (Tripathi & Singh, 2013). Stomatal responses, photosynthetic processes, transpiration, and nutrients such as protein, lipids, non-structural carbohydrates, and minerals are other effects on crops, resulting in changes in crop quality (Tripathi *et al.* 2015). Climate change also affects the coefficient of respiration and the coefficient of maintenance of dry weight of these crops, which are important qualities to maintain in harsh environments by the way (Baligar *et al.* 2012).

Global warming:

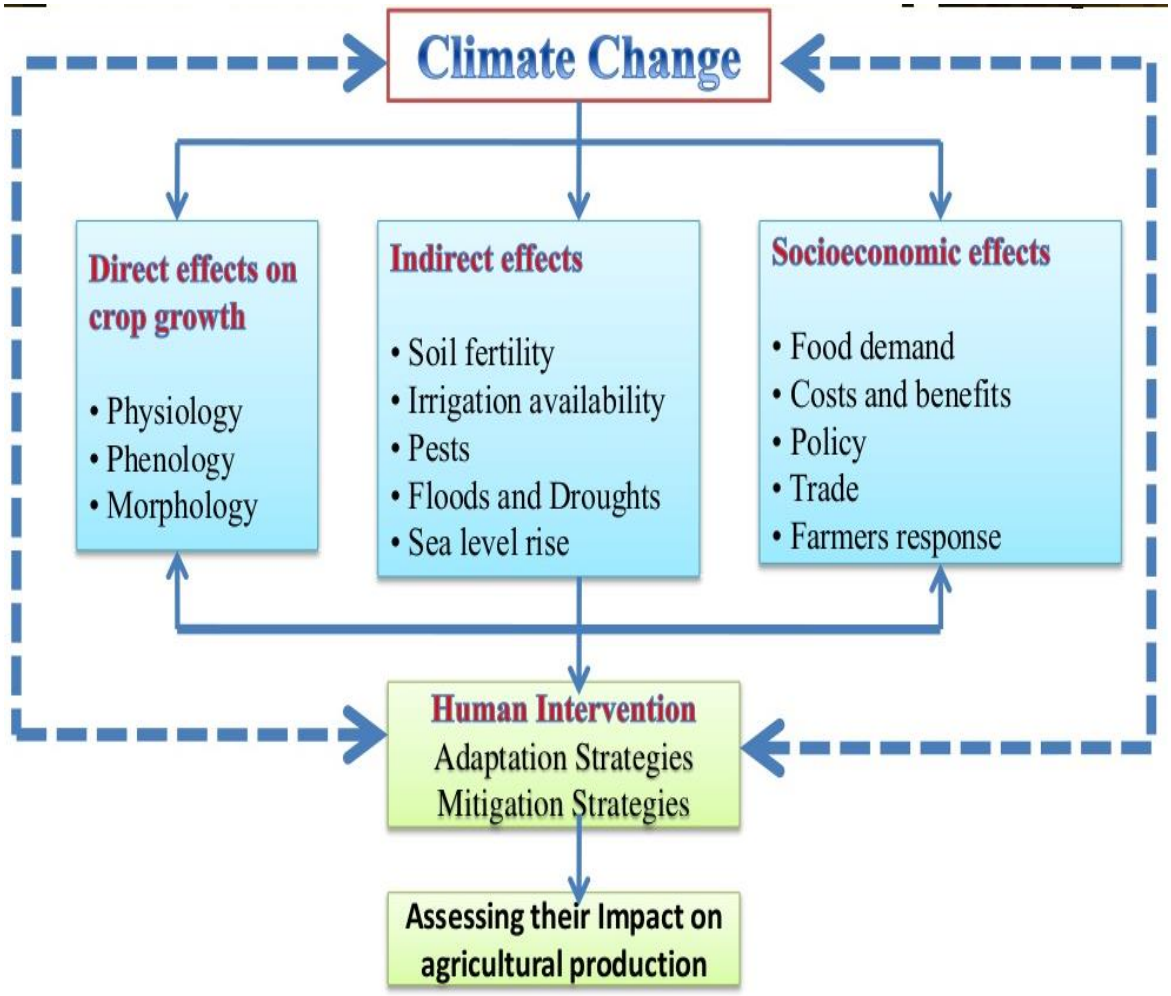
There is a major shift in the gaseous composition of the earth's atmosphere, mainly through increased pollution from the energy, manufacturing and agriculture sectors; widespread

deforestation and rapid changes in land use and land management practises. The effect of these anthropogenic activities is an increased emission of radioactively active gases, i.e. The 'greenhouse gases' are generally referred to as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) (GHGs). The outgoing infrared radiation from the earth's surface is trapped by these GHGs and thus increases the air temperature. As a result of GHG accumulation in the atmosphere, the global mean annual temperature at the end of the 20th century increased by 0.4–0.7 ^oC above that observed at the end of the 19th century.

This rising temperature can affect large-scale crop yields. Over the 20th century, increasing temperatures have been reported to play an important role in global warming relative to precipitation. Researchers have reported that with every 1° F rise in temperature, crop yield falls by 3 percent to 5 percent. When temperatures are low and plants are dormant, oxygen depletion is very low and the effect is relatively harmless. However, when temperatures are higher, in as little as 24 hours, oxygen consumption by plant roots and soil fauna and microorganisms will completely deplete the oxygen from the soil water.

Agriculture and climate change as the threefold relationship:

Plant physiology has been profoundly affected in many respects by climate variability. The possibility of various plant stresses is increased by environmental extremes and climate variability. The effects of crop production on climate change are direct, indirect and socio-economic. In addition, events of climate change (drought, flood, high temperature, hurricane, etc.) are significantly increased as recorded by the Food and Agriculture Organization (FAO).



Effect of climate change:

Global climate change:

- Stimulated impact of global climate change on irrigated wheat yield in North India:

Sources- **Senapati *et***

- Stimulate impact of global climate change on rainfed wheat yield in central India:

Sources- **Senapati *et al.*,2013**

Other observation of climate change in global climate-

- Globally hot days, hot night, and heat waves become more frequent.
- Frequency of heavy precipitation event has increase over most land areas.
- Globally average sea level rose at an average rate of 1.8 mm per year over1961-2003.

Prediction of future global climate

- Tropical cyclones to become more intense, with heavier precipitation.
- Snow cover is projected to contract.
- Hot extremes, heat wave and heavy precipitation event will become more frequent.
- The projected sea level rises up to 0.18-0.59 meters

Current issue in agriculture:

- Over production in short term yet food insecurity for a large population.
- Stagnation/ decline in yields.
- Diversification.
- Natural resource management-SOM decline, input use efficiencies, narrow genetic base.
- Quality and quality of water resources.
- Profitability: increasing cost and deceleration in TFP growth.

Impact of climate change in agriculture:

- Sinha and Swaminathan (1991),showedthat an increase of 2^{o}Cin temperature could reduce the rice yield by about 0.75% ton/ha in the high yield areas; and a 0.5 c increase in winter temperaturewould reduce wheatyield by 0.45% ton/ha.
- Allen *et al.* (1996), conclude that carbon fertilization effects would not be able to offset the negative impacts of high temperature on rice yields.
- Saseendran *et al.* (2000), showed that for every onedegree rice in temperature the decline in rice yield would be about 6%.
- Agrawal *et al.* (2003), using WTGROWS and recent climate change scenarios estimates impact on wheat and other cereal crops.

Impact of climate change on Indian agriculture

Sr. No	Events	Potential impacts
1.	❖ Cold periods become warmer and shorter ❖ Day and night become hotter	❖ Increased yield in temperate region; decrease yield in tropical region. ❖ Increase in out breaks of new insect pests and pathogen
2.	❖ Heavy precipitate leading to floods	❖ Damage to crop; soil erosion ❖ Inability to cultivate land owing to water logging of soils
3.	❖ Drought (frequency occurred)	❖ Lower yields from crop damages and failure, loss of arable land
4.	❖ Intence tropical cyclone	❖ Damage to crop
5.	❖ Extremely high sea level	❖ Sailinization of irrigation water ❖ Estuaries and freshwater system

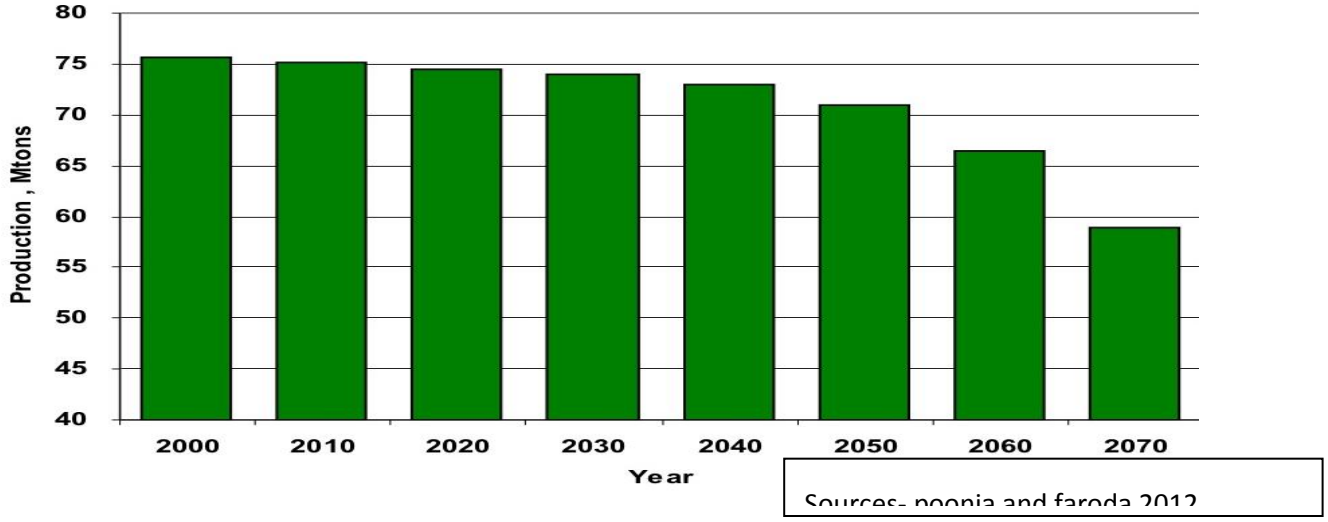
Global climate change, through its direct and indirect impacts on crops, soils, livestock and pests, will affect agriculture. An rise in the amount of atmospheric carbon dioxide will have a fertilisation effect on C_3 photosynthetic pathway crops and will therefore stimulate their growth and productivity. Depending on the current ambient temperature, the rise in temperature will decrease crop length, increase crop respiration rates, adjust photosynthate division into economic products, affect the survival and distribution of pest populations, accelerate soil nutrient mineralization, decrease fertilizer-use efficiencies, and increase the rate of vapo-transpiration. Indirectly, due to snow melt, the availability of irrigation water, the frequency and severity of inter- and intra-seasonal droughts and floods, the transformation of soil organic matter, soil degradation, changes in insect profiles, the decrease in arable areas due to the submergence of coastal lands, and the availability of resources, there could be significant effects on land use. The socio-economic environment, including government policies, capital availability, prices and returns, infrastructure, land reforms, and inter-national trade that could be influenced by climate change, are equally important determinants of the food supply (Raza, Razzaq and Jinsong Xu,2019)

Reduction in Crop Yield

Rice: Rise in the mean temperature above a threshold level will cause a reduction in agricultural yields. A change in the minimum temperature is more crucial than a change in the maximum temperature. Grain yield of rice, for example, declined by 10% for each 1 °C increase in the growing season minimum temperature above 32 °C (Pathak *et al*., 2003). The climate change impact on the productivity of rice in Punjab (India) has shown that with all other climatic

variables remaining constant, temperature increases of 1 °C, 2 °C and 3 °C, would reduce the grain yield of rice by 5.4%, 7.4% and 25.1%, respectively (Aggarwal *et al*., 2009b).Cereal productivity decreased by 10-40% by 2100.

Wheat; Every 1^{o}c increased in temperature reduce wheat production by 4-5 million tons. Loss only 1-2 million tons if farmers could plant in time. Reduce frequency of frost damage; less damage to potato, peas, mustered. Increased drought, floods are likely to increases production variability. Imbalance in food trade due to positive impact on Europe and N. America, and negative impact on us. Increased water, shelter, and energy requirement for livestock; implantation for milk production. Increasing sea and river water temperature are likely to effects fish breeding, migration and harvests. Coral reefs start declining from 2030. Considerable effect on microbes, pathogens and insects.



Graph. Potential impact on climate change on wheat production in India

Effects of climate to water logging in wheat plant:

Water logging annually affects vast areas of farmland worldwide as a result of heavy rainfall irrigation soil runoff. This includes wheat (*Triticum aestivum*), where 15-20 percent of the annual crops experience yield losses as a result of the logging of water. Water logging often leads to anoxic soil (absence of O_2) and extreme root hypoxia or anoxia. Flood-sensitive plants with 24 hours of anoxia are seriously affected. Under such conditions, the growth and survival of many plant species are significantly depressed and crop yields can be drastically reduced. Anoxia (lack of oxygen) can be momentarily withstood by flood-tolerant plants, but not for an extended duration of more than a few days. During sowing time and during seedling, flowering, and grain filled season, wheat is very sensitive to water logging; water logging for 30 days during this period reduces grain yield by 50-70 percent due to poor seed set and fever spikes per unit area. Cells are segregated in many wetland plants, exemplified by rice, by a prominent, gas-filled

space that forms a tissue called aerenchyma, which grows independently of environmental stimuli in the root.

Environmental parameters influencing wheat water logging response;

Cooler condition result in less effect of water logging on wheat. Lower temperature result in slower O_2 depletion from the soil, slower root metabolism and slower shoot growth. One example of effect of soil type on the response of wheat to midwinter water logging was yield being reduce by 16% in clay soil compare with 7% in sandy soil ,probably caused by a faster O2 depletion during water logging and slower return to oxic condition upon drainage in the clay.

Mechanism of water loggingin root system;

Root usually obtained sufficient oxygen (O_2) for aerobic respiration directly from the gaseous space in the soil. Gas filled spore in well-drained, well structure soil readily permits the diffusion of gaseous O_2 to depth of several meters. Consequently, the O_2 concentration deep in the soil is similar to that ion humid air. However, soil can become flooded or waterlogged when it is poorly drained or when rain or irrigation is excessive. Water then fill the pore and block the diffusion so slowly in stagnant water that only a few centimeters of soil near the surface remain oxygenated.

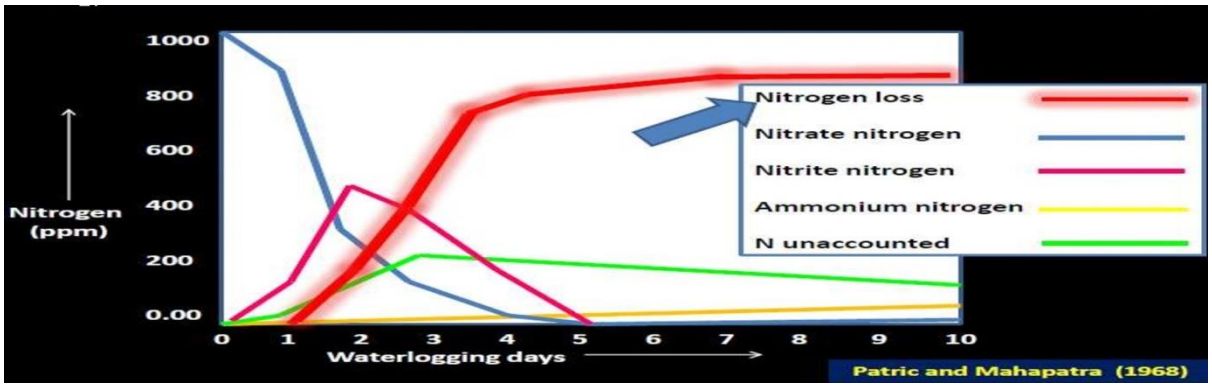
Effect of Soil condition nutrients in water logging:

Water logging affects soil physical, mechanical, electro-chemical and biological properties such as; Eh (almost), soil pH neutralisation, N P K deficiency and toxicity of micronutrients. In addition to oxygen deficiency per se, the possible decline of soil redox and Mn2+ and Fe 2+ and organic acid in many soils may increase. In addition to endogenously generating CO_2 and ethylene death of seminal root, these may reach root and accumulate and restrict adventitious root length due to O_2 deficiency result in low root: shoot ratio. The extension of the root is constrained by the capacity for internal movement of O_2 to the apex. Sub-optimal O2 restricts the uptake and translation of root N to the shoot, with N deficiency leading to decreased shoot growth and decreased grain yield. Though photosynthesis decreases, sugar usually accumulates in waterlogged plant shoots. In shoots of wheat, Mn or Fe toxicity can occur on strongly acidic soil, but possibly not more frequently. Future breeding should concentrate on root internal aeration and better N-used efficiency for water logging tolerance; exploiting the genetic diversity in wheat for these and other characteristics should allow water logging tolerance to be improved. Several studies have shown substantial decreases in yield due to water logging, some yield elements, proline and proline content, as well as wheat chlorophyll a and chlorophyll b.

When exposed to anoxic shock, wheat seedling root loses K+, amino acid and sugar. Depolarization of the plasma membrane contributes to the opening of the voltage-gated ion channel and wheat seedling roots have been recorded with K+ net loss. In addition to the anoxic effects of root solute degradation, organic acid in anaerobic soils can also result in depolarization of the membrane and K+ efflux.

Nitrogen transformation after water logging

Anaerobic soil microorganism derives their energy from the reduction of Nitrate (NO_3^-) to Nitrite (NO_2─)or to Nitrous oxide(N_2O) and molecular nitrogen (N_2). These gases (N_2 and N2O) are los to the atmosphere in the process called denitrification.



Response of ethylene hormone in water logging on wheat plant:

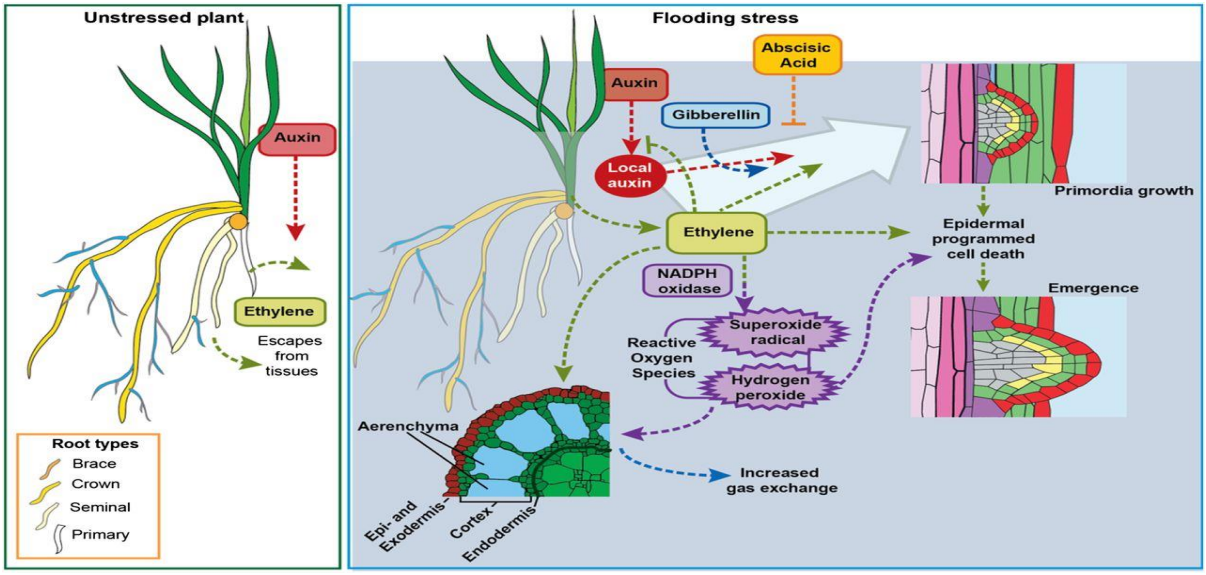
Phytohormones play a vital role in stress response. One of the most important members of phytohormones is ethylene. Ethylene has a function in control of seed germination, ripping, leaf growth and senescence under different abiotic and biotic climatic stress. Abiotic stress such as salinity, waterlogging, high temperature, heavy metal contact, nutrient deficiency, and drought are the reason which modulate synthesis of the ethylene.

Aerenchyma formation in root system of wheat;

Ethylene is involved in the formation of inducible aerenchyma in certain gramineous plant roots. Wheat seedling helps to withstand stagnant deoxygenated environments by inducing lysogenousaerenchyma formation in seminal roots. In addition to the development of aerenchyma in adventitious roots, ethylene facilitates flooding for many other plant acclimacies. By hypoxia or water logging, the amount of adventitious root per wheat plant is usually reduced but proportionally less than the number of tillers per plant; thus, adventitious root number per tiller increases. As 21 d of hypoxia (5 percent oxygen) reduced the amount of adventitious root in two water logging sensitive varieties by 17 percent and 37 percent from aerated control, while this increased by 82 percent in the water logging resistant variety, wheat shows genotypic variation for the formation of adventitious root. The adventitious root of wheat is based on the genotype and ethylene concentration in response to ethylene. Generation of ethylene concentration of adventitious roots (0.1, 1.0 and 5.0μLL^{-1}) where only the lowest ethylene concentration promotes these roots, as in a susceptible variety.

Transport from the hypoxic tip back along the root of 1-aminocyclopropane-1-corboxilic acid (ACC) or ethylene movement. Exogenous ethylene raises wheat root porosity from <5 percent to 18 percent in an aerated nutrient solution.

Root O_2 movement is primarily defined by tissue porosity (amount of gas per unit volume of tissue. Root is an essential component of wheat tolerance for water logging. The genotype of water logging tolerance had root porosities of 20 percent, 14 percent and 11 percent, and the genotype of water logging sensitive had root porosities of 8 percent and 6 percent. As ethylene signalling activates lysogenousa



Sources- Steffens and Amanda ,2016

(Adventitious root development in response to flooding)

Under aerated condition, gaseous ethylene escape from plant tissue, but during flooding, wheat act as physical barrier, trapping ethylene in the plant, GA enhance the ethylene promoted adventitious root growth, while abscisic acid reduce the effect. Ethylene trigger active O2 species production, and together they trigger epidermal program cell death for root emergence and cortical program cell death lysogenousaerenchyma formation. The main different some eudicots (e.g. tomato) is the requirement for de novo adventitious root initiation via auxin and ethylene signalling. In the cross section epidermais and exodermis are combined, but the exodermis can be several cell layers adjacent to the epidermis. Yellow root are adventitious root, blue and pink root are lateral root, and white root are primary roots. Point arrow represent positive interaction, and flat-ended arrowrepresentnegativeinteraction.)

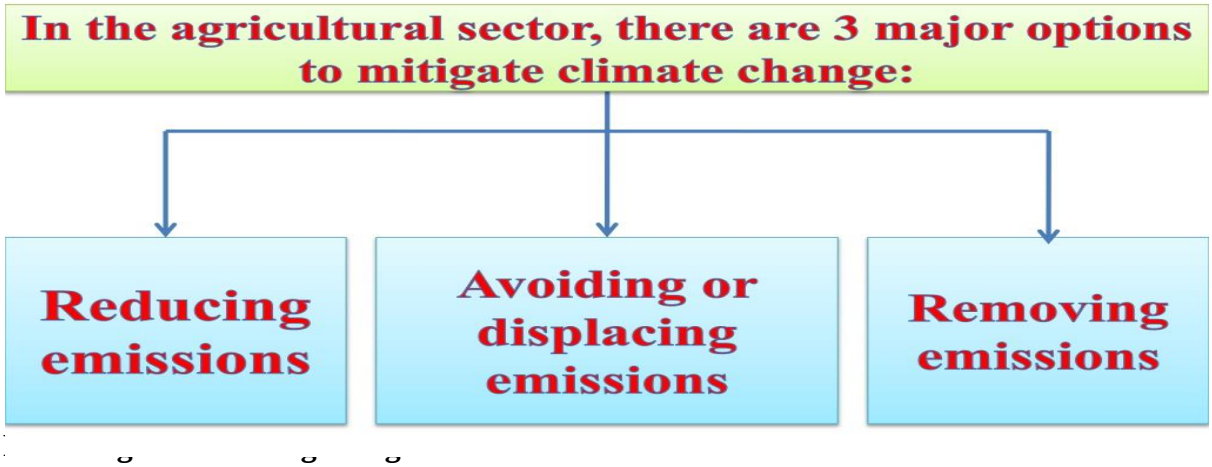
Anoxia tolerance of wheat root:

Without O_2 supply, respiration ceases and anaerobic energy metabolism produce some ATP. Survival in anoxia varies from hour to month for plant species and organ. With wheat root being able to re-grow after 24h of anoxia when hypoxically pre-treated. During hypoxia, the activities of pyruvatedecarboxylase (PDC)and alcohol dehydrogenase increased by 2-fold to 4-fold and 3.5-fold to 17-fold and the rate of ethanol production (and thereby ATP generation) in the subsequence anoxia increased 1.4-4 time.

Effects of water logging on wheat shoot growth:

Waterlogging generally reduces the shoot growth of wheat. The reduction of shoot growth results from less tillering and reduce the rate of leaf growth and smaller leaf size. Nitrogen deficiency is one likely cause of the reduced tillering and slower growth. The reduced rate of leaf area production, as well as early senescence of basal leaf.

Mitigation strategies in agriculture:



Adopting improved cropland management practice.

- Minimal soil disturbance
- Improved grazing management(e.g. stock rate management,rotational razing) can reduce emissions from volatization of organic soil carbon
- Integrated nutrient management can reduce emission by reducing leaching and volatile losses
- Improving nitrogen use efficiency through precision farming
- Improving fertilizer application timing
- Conversion of agriculturally marginal soil to forest land

Improve livestock feeding practice to reduce emission from enteric fermentation

- Using dietary additive to increase efficiency of the digestive process
- Improvement in forage quality and quantity
- Seeding fodder grass or legume with higher productivity and deeper roots

Reducing deforestation and forest degradation

- Reducing deforestation and forest degradation and adopting sustainable management of existing forest can reduce emission.

Adopting improved aquaculture management

- Selection of suitable populations of species
- Increasing feeding efficiency
- Switching to herbivorous or omnivorous aquaculture species will reduce emission from input use

1. **Avoiding and displacing emissions**

Improving past-harvest practice

- Reducing past harvesting food losses (improved storage and past harvest handling) will contribute to decreasing emissions.

Improving energy use in agriculture production

- Increasing energy efficiency and replacing fossil fuel with biofuel will reduce emissions per unit of food produce.

2. **Removing emissions**

Improved agronomic practices

- Reduced tillage (minimal cultivation)
- Uses of cover crops
- Incorporation of crop residue
- High carbon crops (fruits or nut orchard, vines tea coffee)

Improved soil and water management

- Counter farming, strip cropping, growing cover crops crop rotation, mixed cropping mulching, bunding, terracing, organic manure et.
- Drip and sprinkler irrigation and line canal with plastic films, reducing distribution losses of irrigation water etc.

Agro-forestry, afforestation/ reforestation forest restoration increase carbon storage

- Combining crops with tree for timber and fodder
- Establishing shelter belts and riparian zones strip with woody species system
- Conversion from non-forest to forest land uses and degraded forest to fully carbon stock forests.

Planting mangrove in coastal areas

- Replanting mangrove in coastal areas will create carbon sinks

Adaptation and mitigation Strategies

There is several adaptation measures that the agricultural sector can undertake to cope with future climate change. These include:

Genetics & Breeding and Biotechnology

- Conversion of C3 plants to C4 plants
- Transfer of gene from legume to non-legume crops
- Need to develop extreme conditions (heat, drought, floods) tolerant crops and cultivars
- Develop climate ready crops (defining new Ideotypes)
- Selection and breeding of high yielding rice cultivars with low methane emission potential
- Transgenic development for biotic and abiotic stress

Improved Agronomic Practices

- Changing planting dates
- Planting different varieties or crop species
- Development and promotion of alternative crops
- Developing new drought and heat-resistant varieties
- Improved crop residue and weed management
- More use of water harvesting techniques
- Better pest and disease control for crops
- Implementing new or improving existing irrigation systems

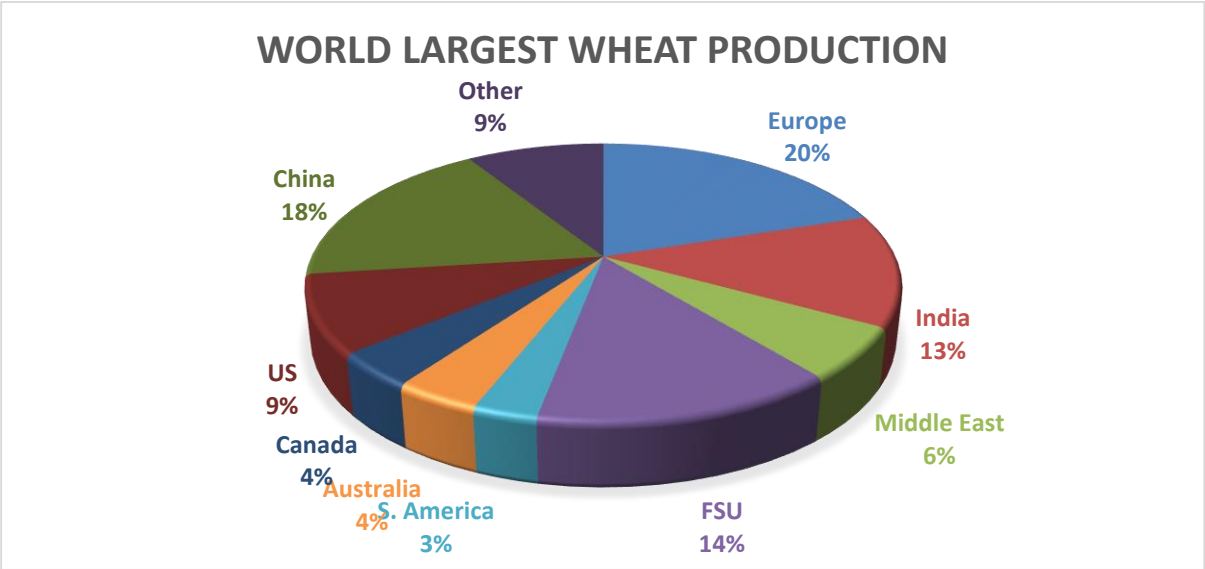
(Reducing water leakage, soil moisture conservation - mulching)

- Several farming practices and technologies can reduce green house gas emissions and prevent climate change by enhancing carbon
- Storage in soils; preserving existing soil carbon; and reducing carbon dioxide, methane and nitrous oxide emissions.
- Reducing use of fertilisers:By applying only the amount of fertiliser that the crop needs, precisely and at the right time, a tremendous amount of greenhouse gas releases can be prevented.
- **Protecting the soil:** By increasing the carbon content through avariety of measures such as cover crops, agricultural soils can beturned into carbon sinks and can greatly reduce agriculture'scontribution to climate change.
- ***Land restoration and land use changes:*** Modifications to grazingpractices, such as implementing rotational grazing and seasonal useof rangelands. Converting marginal cropland to trees or grassmaximizes carbon storage.
- ***Methane should be used:*** Methane can be used to fuel a variety of on-farm applications, as well as to generate electricity.

Potential impact of climate change on wheat production:

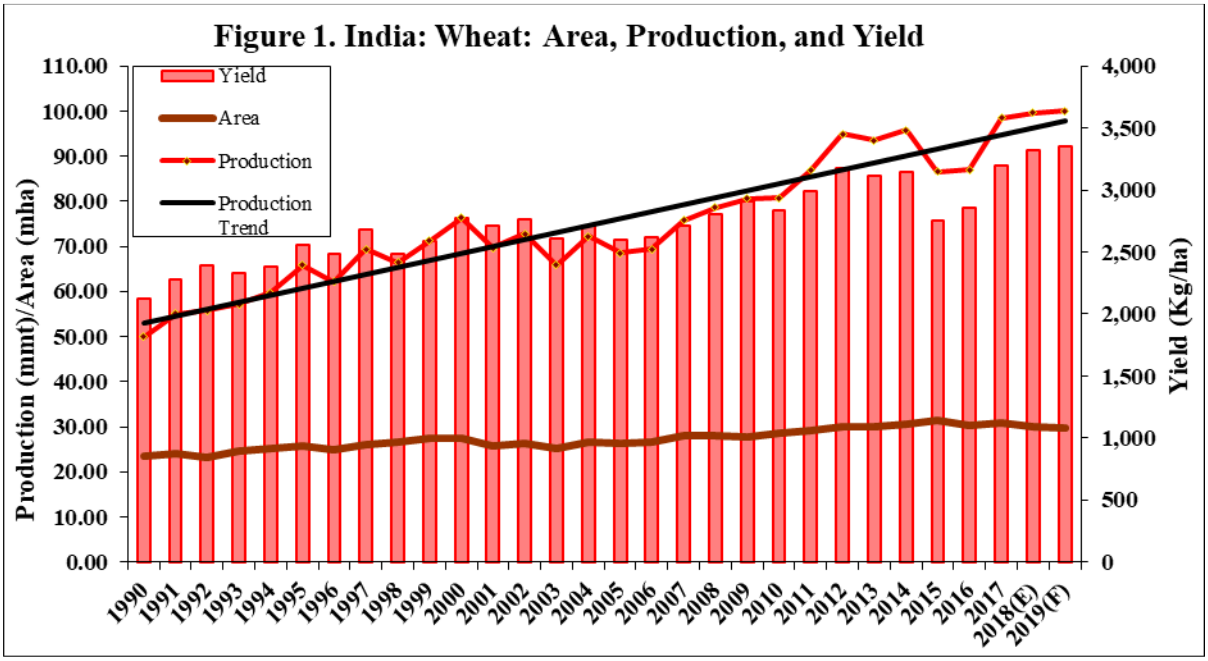
Global production of wheat; Grain Brokers Australia (4 Mar 2020)

Late last week, the International Grains Council (IGC) published its latest report on the grain sector, and global wheat production is expected to set another record high of 769 million tonnes in the 2020/21 marketing year. This compares to the 763 million tonnes that are projected to be produced in the current season, a record by itself, being 1 million tonnes higher than the previous mark set in 2017/18. The expected increase in global output in 2020/21 will more than account for Australia alone, as a return to a more normal season would see at least 10 million tonnes of domestic production added. A repeat of the 2016/17 season may see almost 20 million tonnes added to the disappointing production outcome of this season, especially given the potential area allocated for wheat after the back-to-back east coast droughts. Global wheat production has been steadily rising every year since reaching the 700 million tonne mark for the first time in 2013/14.



Wheat production in India:

Indian production has increased to such an extent in recent years that it is now a potential net exporter, albeit in small quantities, in coming seasons. India is the second-largest wheat producer in the world behind China. Early last week, the Indian Agriculture Ministry released its grain production forecasts for the 2019/20 season, in which wheat output is projected to be a record 106.2 million tonnes. This compares to the 103.6 million tonnes produced in 2018/19, the first time the 100 million tonne production barrier was breached. The expected bumper Indian crop can be attributed to two key factors. Firstly, the area seeded to wheat increased to a record 33.6 million hectares, up 3.7 million hectares compared to last season and almost 2 million tonnes



higher than the previous record set in 2016/17. Secondly, the excellent monsoon season delivered 10pc more than the Long Period Average of 880 millimetres of rainfall. As a result, yields are expected to average close to 3.2 tonnes per hectare, well above the national long-term mean. With the Indian harvest commencing this month, progress will no doubt be monitored with increased interest by the global trade.

Conclusion:

Greater losses in Rabi are expected. Every 1°C temperature rise reduces the production of wheat by 4-5 million tonnes. If farmers could plant in time, they would lose only 1-2 million tonnes. By 2100, cereal production will decrease by 10-40 percent. Climate change will also result in boundary shifts in areas appropriate for such crops to be cultivated. Water logging is a major problem for wheat cultivation around the world and in the USA, where excess water affects about 12 percent of the cultivated soil. Under the conditions of water logging, about 39-40 percent yield loss is reported. In contrast to irrigated crops, yield reductions due to climate change are projected to be more pronounced for rain-fed crops. The decrease in potential wheat yields varies from 1.5 to 5.8 percent in subtropical areas, while the decrease is comparatively higher in tropical regions, indicating that hotter regions may expect higher crops. Researchers have suggested that decreased kernel and tiller numbers are a combined effect that is responsible for reducing wheat yield in water logging. In depressions along roads, canals & railways during the rainy season, water logging conditions are also triggered. During high tidal surges, sea water comes to a particular area. Adaptation strategies can help to some extent to minimise adverse effects, while mitigation options can help in the long run.

Source: Ministry of Agriculture and Farmers Welfare (MoAFW), Government of India (GOI); and FAS/New Delhi forecast for 2019 (MY 2019/20)

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Yield attributes of milk yam (*Ipomoea digitata* L.) tubers at optimum maturity stage

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ABSTRACT

Milk yam is a tuberous climbing medicinal plant having several proven pharmacological properties. Its tuber growth is accessed based on phytochemical investigations during different growth stages at regular intervals by conducting a pot culture study. Its vine cuttings are grown in polybags and tuber quality was accessed up to 24 months after planting. Superior phytochemical and pharmacological properties of tubers were observed at 21 months after planting. It can be conclusively stated that a milk yam tuber at optimum stage of harvest (21 months after planting) had more than two (2.33) number of tubers, with a mean length of 29.50 cm, breadth, 21.90 cm and an average fresh tuber yield of 983.33 g/ plantand dry tuber yield of 414.97 g/ plant.

Keywords: Harvest, months, optimum, planting, quality, stage, superior

INTRODUCTION

Ipomoea digitata L. (Family- Convolvulaceae; Syn*: Ipomoea mauritiana*Jacq.*Convolvulus paniculatus*, *Ipomoea mauritiana*, *Ipomoea eriosperma*, *Ipomoea paniculata*) has been traditionally used in folkloric and Ayurvedic medicine in India and parts of Southeast Asia as a general tonic, anti-diabetic, to treat diseases of spleen and liver and to prevent fat accumulation in the body (Wiart, 2007; Himalaya Global Holdings Ltd., 2016; Flowers of India, 2016).It is a climbing tuberous plant bearing attractively pink coloured bell shaped flowers, commonly known as Milk yam in English or Kshirvidari and Vidarikanda in Sanskrit. It is an aphrodisiac, cardiotonic, demulcent, diuretic, refrigerant, and galactagogue (Sonia, 2020c).The species is distributed throughout India (Bihar, Odisha, West Bengal, Assam, and the west coast from Konkan to Kerala) in deciduous and

evergreen forests and coastal tracts and widely naturalized in tropical parts of the world (Vidya*et al.*, 2020). In Kerala, it is found in Kasaragod, Cannanore, Calicut, Malappuram, Thrissur, Kottayam, Pathanamthitta and Trivandrum districts, in the low and midlands but its commercial exploitation is still very much limited (Nair, 2000).

The commercial medicinal crude drug is its tubers. Its pharmacological activity is attributed to the presence of secondary metabolites and phytoconstituents such as taraxerol, taraxerol acetate, β-sitosterol, scopoletin, 7-O-β- D glycopyranosylscopoletin, t-Cinnamic acid, Umbelliferone, ocetadecyl (E-P-coumarete), N–butyl- ß-D-fructopyranoside, Scoparone, rutin, umbelliferone etc. (Khan *et al*., 2009; Madhavi *et al.*, 2010; Vidya, 2017; Sonia and George, 2020).Usuallymature(bigger size) tubers of milk yamare considered to be rich in phytoconstituents and used by Traditional Medical Practitioners (TMP) for preparing galactagogues and immunomodulatory herbal medicines (Rasayan).But studies proving the quality of mature tubers is limited except a few done by Sonia (2020a and 2020b) based on physical standards and phytochemical composition. These studies revealed that milk yam tubers having optimum, physical standards and phytochemical composition can be harvested at 21 months after planting (MAP). Tubers harvesting at 21 months after planting have ideal nutrient composition too (Sonia *et al*., 2017a; 2017b). Hence, the present study is done with the objective to find out the yield attributes of an optimally mature milk yam tuber.

MATERIALS AND METHODS

Rooted vine cuttings of milk yam collected from Instructional Farm, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala, India were raised in polybags and maintained by trailing it in pandals and following cultivation practices recommended by KAU (2013) for a period of 21 months. During 21 MAP, the tubers are harvested and yield parameters viz., number of tubers, length of tuber (cm), girth of tuber (cm), fresh tuber yield per plant(g)and fresh tuber yield per plant(g)of optimally mature milk yam tubers were documented.

Number of Tubers

Number of tubers in each observational plant was counted and recorded and its mean value was worked out.

Length of Tuber (cm)

Length of each tuber from top to bottom in the observational plant was measured and its average was recorded and expressed in centimeters (cm).

Girth of Tuber (cm)

Tuber girth at its thickest portion was measured, its average was recorded and expressed in centimeters (cm).

***Fresh Tuber Yield Per Plant*(g)**

Fresh weight of tuber/s from each observational plant was recorded using an electronic balance, mean value worked out and expressed in grams (g).

***Dry Tuber Yield Per Plant* (g)**

Average dry tuber yield from the observational plants harvested at optimum maturity was calculated by drying the tubers from each observational plant in a hot air oven at 110 ^{0}C for 48 hours and dry weight was determined and expressed in grams (AOAC, 2000).

RESULS

Yield attributes viz., number of tubers, length of tuber (cm), girth of tuber (cm), fresh tuber yield per plant and dry tuber yield per plant observed during optimum maturity of the tubers are presented in Table 1.

Number of Tubers

At optimum stage of maturity (21 MAP), milk yam plants were having more than two (2.33) number of tubers.

Length of Tuber (cm)

Length of milk yam tubers at optimum maturity (21 MAP) was recorded as 29.50 cm.

Girth of Tuber (cm)

Tuber girth recorded during optimum maturity (21 MAP) of milk yam tuber was 21.90 cm.

Fresh Tuber Yield Per Plant (g)

A single milk yam plant at optimum maturity stage (21 MAP) recorded 983.33 g fresh tuber yield.

Dry Tuber Yield Per Plant (g)

Dry tuber yield recorded by optimally mature milk yam tuber (21 MAP) was 414.97 g.

Table 1. Yield attributes of milk yam (*Ipomoea digitata* L.) tubers at optimum maturity

Sl. No.	Parameters	Average
1	Number of tubers	2.33
2	Length of tuber	29.50 cm
3	Girth of tuber	21.90 cm
4	Fresh tuber yield plant^{-1}	983.33 g
5	Dry tuber yield plant^{-1}	414.97 g

DISCUSSION

Optimum maturity can be defined as that stage of maturity at which a commodity has reached sufficient stage of development that after harvesting and postharvest handling the quality will be acceptable to the ultimate consumer (Kader *et al*., 1985). In the present research work, optimum maturity stage of milk yam tubers was destined as 21 months after planting (MAP) by evaluating phytochemical parameters from three MAP to 24 MAP at respective intervals. An optimally mature milk yam plant was having more than two number of tubers having length, 29.50 cm; breadth, 21.90 cm; fresh tuber yield, 983.33 g and dry tuber yield, 414.97 g (Plate 1.).

Plate 1. Milk yam (*Ipomoea digitata* L.) tubers at optimum maturity (21 MAP)

At 21 MAP, physical standards of milk yam tubers were, moisture content (57.80 per cent), total ash (4.74 per cent), water soluble ash (3.22 per cent), acid insoluble ash (0.60 per cent), crude fiber (6.19 per cent), starch (39.17 per cent) and pH value (5.29)(Sonia, 2020b). Water soluble extractive value (12.53 per cent) and alcohol soluble extractive value (20.87 per

cent) met the standards of AYUSH (2006). Primary metabolites viz., carbohydrate (68.25 g/ 100 g), protein (6.63 g/ 100 g) and fat (0.81 g/ 100 g) as well as secondary metabolites viz., alkaloids (0.83 mg/ AE g), glycosides (1.40 µg/g), flavonoids (0.54 mg/ QE g), saponins (9.50 mg/ DE g) and phytosterols (1.18 mg/g) were present in appropriate quantities during 21 MAP(Sonia, 2020a).Phytochemical evidences are the most reliable one for ensuring the optimum maturity. In milk yam tubers chromatographic investigation of umbelliferone concentration recorded maximum during optimum maturity (Sonia and George, 2020). However, up to date, no study has been conducted to compare the yield attributes of milk yam tubers at 21 MAP or more maturity. Vidya (2017) had documented yield data for one year old milk yam tubers. Correlations exist between yield attributes of milk yam tubers with other growth parameters and phytochemical constituents which were also established in the study by Vidya (2017).

CONCLUSION

Rooted milk yam vine cuttings can be planted and optimally mature tubers having superior physical standrards, nutritional and pharmacological composition can be obtained when harvested at 21 months after planting. Tubers harvesting by 21 months after planting have the following average yield attributes- number of tubers- more than two (2.33), mean length of tubers -29.50 cm, mean breadth of tubers- 21.90 cm, an average fresh tuber yield of 983.33 g/ plantand dry tuber yield of 414.97 g/ plant.

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Conservation Practices Utilized for Blankets, Razai, and Dohar by Home Makers

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ABSTRACT

The processes by which textiles are cared for and stored to be saved from potential damage relate to the conservation and restoration of textiles. Depending on the form of collection, the area com es under the artconservation category as well as library preservation.In this case, a wide variety o f items, including tapestries, carpets, quilts, clothes, flags and curtains, as well as objects containi ng textiles such as upholstered chairs, dolls and accessories such as fans, parasols, gloves and hat s or bonnets, are protected by the principle of textile conservation. Many of these items, often by a skilled conservator, need specialist care. Present study was carried out to find out the Conservation practices used for Blankets, Razai, and Dohar by home makers. For this purpose thirty women residing in Kanpur were selected for the study, structured interview schedule was used for data collection. The results revealed that respondents know about the care and maintenance of dohar razai and blanket but they faced difficulty in washing and handling.

KEYWORDS: Conservation, Restoration, Cleaning, Care and Maintenance, Storage

INTRODUCTION

Conservation of textile refers to the procedure by which textile restoration are cared and maintained to be preserved from future damage. The concept of restoration of textile interpolate to a wide range of artifacts including blanket, raza, dohar ,quilts, tapestries, curtain as well as thing which contain textile such as upholstered , and accessories. The Hindi word doharana translates to repeating and 'dohar' implies layers. These traditional Indian summer blankets are comprised of three sheets of mulmul, airy, ultra-breathable cotton muslin once exclusive to royalty. A razai is made of a thick layer of wadding, much like a dohar. However, the only difference lies in the padding. While a razai is padded with cotton layers and warm

covers, a comforter gets filled with wool, feathers, and certain silk-based materials. With cold environmental factors, a comfortable bed and comfortable covers, are every one of the one requirements to get past this frigid temperature. Keeping your room in a state of harmony with the season is extremely fundamental. With the initiating of winter season it gets critical to pile up your delicate and comfortable covers that will keep one warm. A Dohar Blanket can pursue away the nippy winter during evenings to keep bones warm during chilly and freezing season. Putting together bedding accessories and ensembles can be tricky and sometimes expensive too. But few purchases that we already have in home can save good amount of money and can result in a gorgeously dressed bed. Proper care will result in many years of use of blankets, razai, and dohar. The elasticity of fiber makes it naturally wrinkle-resistant and prone to holding its shape. There is no need for frequent cleanings. Fibers resilience, low static, and hairy surface help it to repel dirt and other elements. Their long-term preservation is dominance by huge agents of deterioration, incorrect relative humidity, including light, pests, incorrect temperature, physical forces and pollutants. The objective of the study was to know the household Conservation practices used for blankets, razai, and dohar. For this purpose information was collected regarding cleaning, care and maintenance, repellant and storage method used for blanket, razai and dohar.

2. METHODOLOGY

The present study was conducted under taken on a randomly selected thirty respondents residing in Udaipur, Rajasthan. The respondents were interviewed using a pre-designed structured interview schedule. Suitable statistic techniques was used for analysis of data.

3. RESULTS AND DISCUSSION

3.1 General Information of the respondents: Majority (60%) of respondents were in the age group of 31-40 years, 40.00 percent were between the age group of 41-50 years. It was noted that equal percentage of respondents were under the category of literate, middle level education and post graduate and forty percentage were graduate. Eighty percent of the respondents belonged to nuclear family and rest were from joint family.

Table 1 General Information of respondents N-30

S.No.	Aspects	Categories	Frequency	Percentage
1	Age (in years)	31-40	24	60.0
		41 -50	6	40.0

2	Education	Illiterate	6	20.0
		Middle	6	20.0
		Graduate	12	40.0
		Post Graduate	6	20.0
3	Family Type	Nuclear	24	80.0
		Joint	6	20.0
	Family Size	Small (up to 4 members)	6	40.0
		Medium (5-8 members)	24	60.0
4	Monthly Income (Rs.)	up to 5000	6	20.0
		5000-10000	12	60.0
		10000-20000	6	20.0

Sixty percent had medium family size while rest had small family size. Table 1 depicts that 60 percent of the respondents were in the income range of Rs. 5000-10000 per month.

3.2 Ensure the quality: For ensure the quality of product**,** majority of respondent (46.7percent) preferred labels, 33.3 percent preferred product by trust worthy shops, 13.3 percent preferred wool marks and 6.7 percent preferred labels, trust worthy shop and wool marks.

Table 2: Distribution of respondents by ensure the quality N=30

A	Labels	46.7
B	Trust worthy shops	33.3
C	Wool marks	13.3
D	All above	6.7

3.3 Type of cleaning method used: With regards to type of cleaning method used, 33.3 percent respondents used dry cleaning for blanket washing, while 3.33 percent respondents also dry cleaned the Dohar. Regarding Rajai it was reported that the entire respondent washed Rajai cover once in fortnight. More than half of the respondents (66.7%) used wet cleaning for blanket washing, while majority of the respondents (97.7%) also wet cleaned the Dohar. Few respondents filled the fiber inside the rajai in three to four year. It may due to the cotton wool in a razai clumps over time, thinning the razai and driving the air out, which causes the rajai to become less effective as a protection against the cold. For this reason, prior to the onset of winter weather, it is common for families to get their rajais **carded**, the cotton wool in the rajai is removed, carded to eliminate the clumping, and reinserted into the rajai-cover.

Table 3: Distribution of respondents by type of cleaning method used N=30

Products	Dry Cleaning	Wet Cleaning	No cleaning
Rajai	0	0	100
Blanket	33.3%	66.7 %	0
Dohar	3.33	97.7 %	0

Tiwari & Babel (2013) respondents reported that dry cleaning is the best way to maintain the size, structure, and appearance of wool blanket. Respondents also reported that machine washing or hand washing can result in noticeable shrinkage, loss of fibers, and loss of fabric smoothness.

3.4: Washing method used for Dohar: Half of the respondents used machine wash,16.7 percent respondents used hand wash and 33.3 percent used hand and machine wash both for washing dohar.

Table 4: Distribution of respondents by washing method used for Dohar N=30

S.No.	Washing Method used	%
1	Hand washing	16.7
2	Machine washing	50
3	Both	33.3

3.5 Cleaning duration for Dohar: Majority (43.3 percent) of the respondents wash Dohar in 3 months, (40 percent) wash in 6 months, (10 percent) respondents wash in 1 month and very few (6.6percent) respondents wash Dohar in 15 days.

Table 5: Cleaning Duration used for Dohar N=30

S.No.	Cleaning Duration	%
1	3 Months	43.3
2	6 Months	40
3	1 Month	10
4	15 Days	6.6

3.6 Washing season for Dohar: The source of information (46.6 percent) respondents washes Dohar before using for the first time in winter season and 53.3 percent respondent which is not washes before using for the first time in winter season. Majority (86.6 percent) of the respondents wash the products at the end of the season. Very few (13.3 percent) do not washes the Dohar at the end of the season.

Table 6: Washing Season for Dohar N=30

	Wash before winter season	No wash before winter season
%	46.6	53.3
	Wash after winter season	No wash after winter season
%	86.6	13.3

3.7 Detergent used for washing Dohar: The respondents were asked to about washing the products. Half of the respondents (50 percent) used detergents, (33.3 percent) used Ezee, and (16.6 percent) respondents used detergent and soap both for washing and cleaning the products.

Table 7: Detergent used for washing and drying methods used N=30

Aspect	Categories	%
Detergent used	Detergent	50
	Ezee	33.3
	Detergent, Soap	16.6
Drying methods	Cloth line	63.4
	Balcony railing	26.6
	Flat dry	10.0

3.8 Drying method used for Dohar : Regarding drying methods Figure 1 clearly reveals that (63.3 percent) use flat dry drying whereas (26.6 percent) preferred balcony railing and (10 percent) preferred cloth line for drying methods of products.

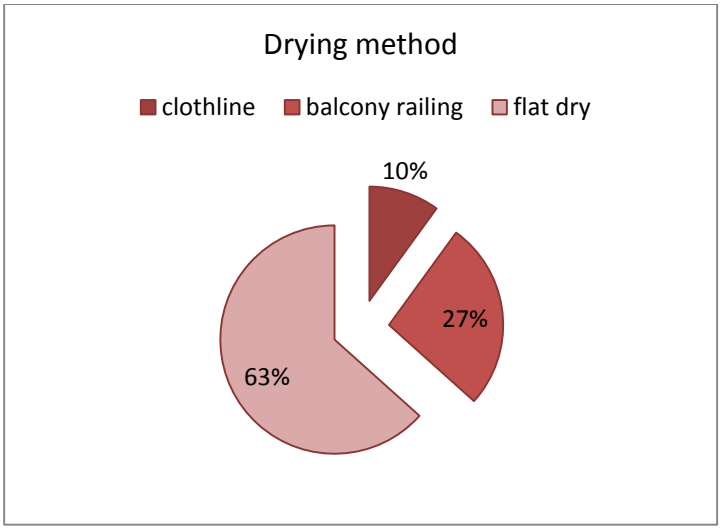

Fig.1 Drying methods prefer for products

3.9 Storage Method: Information gathered regarding storage of the products reveal that (53.3percent) used cupboards, 30 percent respondents used trunk, 13.3 percent respondents used wooden box, and very few 3.3 percent respondents used built in wall racks.

Table 8: Storage method and Covering material used by respondents N=30

Attributes		**Categories**	**%**
Storage method used		Wooden box	13.3
		Trunk	30
		Racks	3.3
		Cupboards	53.3
		All above	3.3
Covering material used	**Yes/no**	Yes	76.6
		No	23.3
	Type of material used	Old sari	30
		Fabric cover	26.6
		Plastic cover	13.3
		Muslin cloth	6.6

3.10 Covering material used: Information was also collected about type of covering material used for safe and dust free storage. Results revealed that majority (76.6 percent) of respondents cover the material before storing in which 30 percent used old sari, 26.6 percent used fabric cover, 13.3 percent used plastic bag, and 6.6 percent used muslin to the cover of the products. (23.3 percent) respondent do not used any type of cover before storing the materials.

3.11 Repellent used for pest control: Information gathered from respondents regarding repellent used while storage it was found that (63.3 percent) naphthalene, (16.6 percent) kapoor, neem leaves (8.9 percen), and (4.5 percent) Kapoor camphor**.** Similar results were reported by Babel & Choudhry (2016)

Table 9: Distribution of respondents by Repellent used for pest control N=30

S.no.	Repellent used	%
1.	Ajwain, cloves	6.6
2.	Kapoor	4.5
3.	Kapoor, Neem leaves	16.6
4.	Naphthalene	63.3
5.	Naphthalene,Ajwain, cloves	6.6
6.	Neem leaves	8.9

3.12 Repairing and Mending: Most of the respondents (73 percent) used stitching, (17 percent) used patch work, (10 percent) used mending they preferred all these methods for giving repairing and strength to the materials Choudhary (2014).

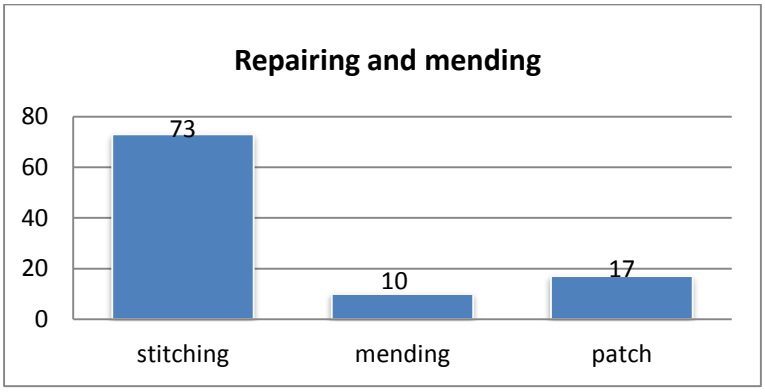

Fig.2 Method used for repairing and Mending

3.13 Problem faced in Care and Maintenance of blankets, razai, and dohar: Eighty percent respondents do not face any problem with care and handling of materials blankets, razai, and dohar, but (20 percent) respondents they face difficulties during care and maintenance of blanket. When asked about the problems faced for care and maintenance of blanket it was reported that pilling and removing odour were major problems.

Removing Pills: Pilling is a natural occurrence often caused by abrasion. Pilling can be removed by using a razor blade or an electric fabric shaver.
Removing Odors: Wool fiber has a distinct scent, due in part to natural wax and oils. Lanolin oil is found naturally in sheep wool and may be noticeable by those with an acute sense of smell. Although rare to pick up on, this scent is a testament to the wool's purity and quality. Researcher recommended that after removing blanket from the plastic bag, allowing it to breathe. Periodically, a trick often used is to sprinkle the blanket with a light dusting of baking soda and then shake it out.

CONCLUSION: The findings showed that respondents know about the care and maintenance of dohar, razai and blanket but they faced difficulty in washing and handling because of the heavy weight and it catches more dust. The respondents ensure about the quality of product because they took the materials by checking labels, wool marks and trust worthy shops. For the maintenance they use sun drying and air drying materials. Naphthalene balls, neem leaves, ajwain and cloves are used as repellent for pest.

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"IMPACT ASSESSMENT OF ANTHROPOGENIC EFFLEUENTS ON ASAN RIVER, SELAQUI DEHRADUN, UTTARAKHAND, INDIA"

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Abstract

Study of impact of assessment of anthropogenic effluents on asan river in Dehradun district were taken in two different month of the year, in the winter (feb.) and the summer (june) regarding its physical chemical and biological properties. The fluxing of the natural as well as anthropogenic waste cause disturbance in its composition. The Physico- Chemical Parameters evaluated the deterioration in some parameter, due to the anthropogenic waste as well as natural waste. The Aquatic Diversity is depleting day by day because the abiotic factors have direct affect on the biotic factors. The impact in the physic- chemical parameters results in unsuitability of water for the designated use. The Planktonic Diversity has been affected in past few years due to alarming rate of the toxic pollutants as observed in the planktonic diversity analysis. Many of the common species have been extinct and some are going to be extinct in few years. Due to the habitat loss the disturbance is caused in the ecology of the river and affects the Biodiversity of the River. There tendency of contamination of pollutants or toxicity increases during the summer because the solubility of pollutants increases as the temperature increases. The depth level is affected by rise in temperature, as result habitat loss of the fishes.

Introduction:-

Water is considered as the elixir for existence of life on earth. Water accounts for about 70% of mass of our body. It is an essential compound of all flora and fauna and forms 75% of matter of the earth crust. Water is distributed in nature in different forms, such as rain water, spring water and mineral water. Rain water is the purest form of naturally occurring water. Therefore, it is necessary to check whether the water quality is in compliance with the standard, and hence, suitable for the designated use, to facilitate the qualitative analysis of the physicochemical

parameters of the river water and to check the impact of anthropogenic waste in river on the plankton density.

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Materials and Method:-

The Asan River fed by the streams of the western part of the Doon valley. The northern section of the river is locally known the Tons River, it is much larger and flows into theYamuna in Jaunsar Bawar region at Kalsi originate from the southern slopes of the Mussorie.

The water samples were analyzed for various parameters in the laboratory of Doon P. G. College of agriculture science and technology, Selaqui, Dehradun, Uttarakhand. The study has been conducted in two different months of the year, in the winter (Feb.) and the summer (June). The deterioration has been observed in the monitored Asan river site.

The weather conditions of the different months give the different parameters of the temperature, pH dissolved oxygen, salinity, hardness etc.

Apparatus used:-

BOD incubators (Remi instruments Ltd, India), Electronics balance (Khera instrument (P) Ltd, India), Hot air oven (Metlex scientific instrument (P) Ltd, India), pH meter(Khera instrument (P) Ltd India),Refrigerators (LG Electronics, India), Plankton net.

Result and Discussion:-

Tabular representation of the physio-chemical parameters of Asan River

Parameters	In Feb. Month	In June Month
pH	7.3-7.5	7.0-7.3
Dissolved oxygen mg/l	5-6	3-4
Temperature °C	21-23	30-34
Alkalinity mg/l	141-145	133-135
Hardness mg/l	288-305	262-272
Salinity ppt	0.21-0.28	0.33-0.37
Co2 mg/l	0.8-1.2	0
T.D.S mg/l	356-389	395-420
Chloride conc. mg/l	18.0-19.6	20-22

The comparative study of the physic-chemical (e.g. DO, CO2 concentration, pH, temperature,hardness,TDS, Salinity, Alkalinity,Chloride conc. Etc.) and the biological factors e. g. quantative analysis of planktonic density is the basic methodology to check the sustainability of water. The Asan River is the most polluted river in Dehradun, being polluted alarmingly by the natural as well as anthropogenic wastes that cause a disturbance in its composition. It has been observed that the Asan River is contaminated by the numbers of the highly polluted wastes canals in the city, peoples are contaminated water of the river by throwing the domestic waste into the river.The monitored site includes the numbers of the industries viz. Dixon Industries , excretes metallic wastes , Lotus Pvt. Limited, excretes the huge amount of waste. These all sources of the pollutants deteriorate the water quality parameters. The physicochemical parameters are analyzed by the following BIS (Bureau of Indian Standard) and WHO. The pH analysis reveals the range of the pH in the February is (7.3-7.5) and in the month of june it changes (7.0-7.3), it changes seasonally. Similar results were observed in the River Yamuna by Khanna et el. (2012).The D.O. analysis evaluates that the temperature is inversely proportional to the dissolved oxygen. The site show the range of D.O. water of winter (feb.) is 5-6 mg/l and

felled to 3-4 mg/l in the month of summer (june). The temperature measurement has been done which shows the range (21°C-23 °C) in the month of (feb.) and (30°C- 34 °C) in the month of the summer (june). The variation of the alkalinity collected from the site in the month of feb. range (141-145 mg/l) and in the month of june it decrease (133-135 mg/l), similarly obvserved by (Tewari. A. et al.) in the river Ganga (2016). This result in fluctuation of the pH as acidic character increases and harms the aquatic organisms).

The hardness analysis of the site revels the range of the month of the feb.(288-305 mg/l) and month of the june it ranges (262-272 mg/l).

The Asan river evaluates the salinity ranges by monitoring which are (0.21-0.28ppt) in the month of the feb. and (0.33-0.37 ppt) in june month. The salinity is quite normal.The carbon dioxide concentration of the study site evaluates the range of (0.8-1.2 mg/l) in the month of feb. and it decline to zero (o) in the summer. That means there is no free co2present in the site,it might be present in the carbonate form and other compounds. The plankton density in the month feb was 926 individuals per liter but it rise in the month of june to 1610 individuals per liter.The summer month (june) shows the higher density of the planktons due to increase in the day length exhibit a required photosynthetic process.

The deterioration in the physic-chemical parameters and the biological parameters of Asan River gave a serious expression regarding to the water quality. If the pollution is not controlled yet, the consequences would be catastrophic for upcoming generation.

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Oral Presentation Abstract

PERFORMANCE OF RICE CULTIVARS UNDER DIFFERENT OF IRRIGATION REGIMES AND SYSTEMS OF CULTIVATION

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A field experiment was conducted on a clay loam soil at Indian Institute of Rice Research (IIRR), Rajendranagar, Hyderabad during the *kharif* seasons of 2017 and 2018 to study the **"Productivity and water use efficiency of rice (*Oryza sativa* L.) cultivars under different irrigation regimes and systems of cultivation"**. The treatments consisted of two irrigation regimes *viz.,* alternate wetting and drying (AWD) and saturation as main plot treatments, three systems of cultivation *viz.,* system of rice intensification (SRI), drum seeding (DS) and normal transplanting (NTP) as sub plot treatments and four cultivars namely DRR Dhan 42, DRR Dhan 43, MTU-1010 and NLR-34449 as sub-sub plot treatments laid out in split-split plot design with three replications and comprises of 24 treatment combinations.Among the different rice cultivars, DRR Dhan 43 recorded significantly superior number of panicles m^{-2}, panicle dry weight (g), test weight (g), length of the panicle (cm), total number of grains $panicle^{-1}$ and number of filled grains $panicle^{-1}$ than other cultivars. Number of unfilled grains $panicle^{-1}$ and chaffy grain percentages were significantly higher with DRR Dhan 42.DRR Dhan 43 recorded higher water productivity as well as WUE as compared to other cultivars. DRR Dhan 43 noticed significantly higher grain and straw yields as compared to other cultivars during both the years of study.Among different rice cultivars, DRR Dhan 43 recorded significantly higher gross returns, net returns and B:C ratio as compared to other cultivars followed by MTU-1010. Whereas inferior gross returns, net returns and B:C ratio ratiowere observed in DRR Dhan 42.

Keywords: Alternate Wetting and Drying, Cultivars, Drum Seeding, System of Rice Intensification, and Water Use Efficiency

HEAVY METAL TOXICITY AND THE ROLE OF THERMOPHILES IN BIOREMEDIATION OF HEAVY METALS

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Heavy metals are discharged from various industries such as pharmaceuticals, textile, batteries, paints, fertilizers, electroplating, metallurgical processes, plastic manufacturing, mining, and glass. The released amounts of heavy metals are being added into the soil and water resources by anthropogenic and natural activities. Increased concentrations of these heavy metals responsible to cause lethal and chronic diseases in humans and affect the metabolism of plants. Heavy metals toxicity reduces the mental health, central nervous system, damaged blood composition, and vital organs. Long-term exposure to heavy metals may give rise to muscular and neurological degenerative processes that imitate muscular dystrophy, multiple sclerosis, Alzheimer's disease, and Parkinson's disease in humans. Free radicals and reactive oxygen species are the result of heavy metals that lead to cell oxidation stress. The human and aquatic animals can harbor many toxic and hazardous substances including heavy metals such as Chromium (Cr), Zinc (Zn), Iron (Fe), Cadmium (Cd), Lead (Pb), Mercury (Hg), Arsenic (As), Nickel (Ni), etc. Cadmium (Cd), Lead (Pb) and Mercury (Hg) ions can bind with the cell membranes, then interfering with the process of cell transportation. Cd is also responsible to cause itai-itai disease and chromium (Cr), and nickel (Ni) can cause cancer. Heavy metals can be reduced by the conventional physicochemical methods such as precipitation, reverse osmosis, evaporation, electrochemical treatment, and ion-exchange but these are expensive and non-ecofriendly approaches. Microbes have the active process of intracellular compartmentalization, enzymatic transformations, intra or extracellular entrapment, metal-siderophore interaction, transformation, volatilization, and efflux pump mechanism through which they can resist, detoxify, degrade or metabolize the hazardous

heavy metals. The unique cell wall structures and thermo-adaptation mechanisms of thermophilic bacteria like Bacillus, *Thiobacillusdenitrificans, Thermusthermophilus,* and *Thermococcus*help in heavy metal Bioremediation. Thermophiles are surviving in high temperatures conditions, between the range of 41°C to 122 °C and they have a high potential to eliminate contaminants of heavy metals from the environment. It is concluded that microbe's based bioremediation is a very good, eco-friendly and cost-effective biotechnological approach to reduce heavy metal contamination from the soil and water bodies.

Key Words- Bioremediation, Microbes, Thermophiles, Heavy Metals, Contamination.

CORRELATION AND CAUSE - EFFECT OF PHYSIOLOGICAL PARAMETERS WITH SEED YIELDAMONG INDIAN MUSTARD (*Brassica juncea* L.Czern& Coss) GENOTYPES UNDER CLIMATOLOGICAL DROUGHT CONDITION

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Abstract

Modern agriculture is facing multiple challenges for a substantial increase,in production to meet the needs of a escalating human population. Water dearth is a deadly consequence of both population growth and climate change and is one of the most severe factors limiting global crop productivity. With the aim of study correlation and cause effect under no irrigated and irrigated condition on some physiological traits on yield an experiment on Indian mustard (*Brassica juncea* L.Czern & Coss), was conducted in Randomized Complete Block Design accommodating 20 genotypes, from various Rapeseed & Mustard centres located across country, randomly in three replications during *Rabi* 2016-17 in Dr. Rajendra Prasad Central Agricultural University , Pusa, Samastipur , one subjected to residual moisture condition inside the Rainout shelter and another one provided with two normal irrigation. Analysis of variance revealed considerably exploitable variability for all the 15 traits. Under both conditions of phenotypic correlation revealed that grain yield per plant showed significant and positive correlation with RWC, LMSI, CC, CA, PERO, PRO, RGR, LAI, SLW, OY except ELWL. Phenotypic path coefficient under both condition revealed that all the physiological parameters showed the low direct effect except oil yield showed high direct effect on grain yield per plot. This indicated that improvement in all the physiological parameters which showed significant positive and direct effect on grain yield per plot will ultimately enhances the grain yield. The improvement in grain yield will also in turn enhance oilseed simultaneously as directly correlated.

Key words: *Brassica juncea* L., Physiological traits, Residual moisture, Root parameters, Deficit Irrigation

EVALUATION OF IN-VITRO ANTIMICROBIAL PROPERTIES OF THE UNDERUTILIZED MEDICINAL FRUIT MALABAR TAMARIND (*Garcinia gummigutta)*

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ABSTRACT

The increasing problem of antibiotic drug resistance by pathogenic microorganisms in the past few decades has recently led to the continuous exploration of natural plant products for new antibiotic agents. Recently, natural products have been evaluated as source of antimicrobial agent with efficacies against a variety of microorganisms. In this regard Phytobiotics have attracted considerable interest as the substitutes for sub therapeutic antibiotics in the management of several metabolic disorders. Among which one important underutilized spice crop Malabar Tamarind (*Garcinia gummigutta)* is commonly used in India as a folk medicine in treating several metabolic disorders.The lack of information about their biological activities led us to investigate the neutraceutically superior underutilized medicinal fruit of Karnataka Western Ghat Malabar tamarind (*Garcinia gummigutta)* for its potentialin-vitro antimicrobial activities against human food borne pathogens such as *B. subtilis , S. aureus, E. fecalis, E. coli and S. boydii.* The infusion extracts were used and the zone of inhibition was determined by agar well diffusion method. The result shows that there was no inhibition zone at the sample concentration of 1 per cent of fresh rind. Whereas at the concentration of 10 per cent dry rind showed maximum zone of inhibition of 14.23 mm, 12.43 mm, 18.42 mm, 15.75 mm and 14.52 mm against *B. subtilis , S. aureus, E. fecalis, E. coli and S. boydii* respectively. Hence the minimum inhibitory concentration unit (MIU) of fresh rind was at 2.5 per cent and dry rind was at 1 per cent of concentration.

Key words:*Garcinia gummigutta*, Malabar Tamarind, Phytobiotics, Antimicrobial activity.

Economic Viability of Scientifically Advanced Cultivars of Apple through Bootstrap-Inferences

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Abstract

Scientifically advanced apple cultivars have been introduced in the union territory of Jammu and Kashmir with a view to make optimal utilization of available land resources to maximize production and productivity of apple especially superior grade. The new cultivars came into baring after 3-4 years of its planting. The traditional plantation system with a long gestation period of the plantation (8-9 yrs.) yielded too low per unit of land besides it involved hectic and cumbersome management practices. Scientifically advanced cultivars are different from traditional plantations in plant density, productivity, gestation lag, management practices etc. The study employs propensity score matching for making reliability of the ex-post analysis and results revealed thatproductivity of apple increased which intern yield high returns to the farmers up to Rs. 1200000/ha^{-1}. The study further reveals that despite high establishment costs, new cultivars benefited apple growers through early fruit bearing, higher productivity and employment generation in the region.

Key words: Propensity score, ex-post, cultivars, productivity, fruit bearing.

Diversity ofEndophytic fungal assemblages in submerged musk grass an aquatic plant of *Chara delicatula* L.

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ABSTRACT: Endophytes were isolated in culture from the surface of the water to conduct photosynthetic leaf tissues during six month continuous growing seasons. These plants were collected from a freshwater pond in winter season in Tamil Nadu. A total of 33 representing species was recovered from a total of 600 (every month/100 bits) plant leaves tissues segments of musk grass; stonewort in the submerged aquatic plant of *Chara delicatula*. Although isolation frequency was low-level, endophytes were phylogenetically diverse groups and species-rich. Compactly among the six months, a continuous study in leaf sampled and a pond revealed that frequency isolation and diversity did differ significantly between collection periods, among species are slightly varied in the maturation to leaves ages. The endophytic fungi have diversely isolated. Among these fungi, three belong to ascomycetes, five fungal species belonging to coelomycetes and twenty hyphomycetes beside to five sterile forms. These endophytic fungi are showed that contact with the aerial leaves tissues. Hence, they may be air-borne microbes.

Keywords: Aquatic habitat, *Chara*, fungal endophytes, tissues specificity

Soil organic carbon and its fractions as influenced by the short-term tillage and cropping system in alluvial soils of subtropical eastern India

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An investigation was carried out in farmers' fields located in theCoochbehar and Malda district, West Bengal (subtropical eastern India) to assess the short-term (4-year) effect of tillage (zero tillage, ZT and conventional tillage, CT) and cropping system (rice–wheat, RW and rice–maize, RM) on carbon (C) dynamics in the soils of recent and old alluvial nature. Thetotal organic C (TOC) and its fractions such as hot water extractable C (HWEC), particulate organic C (POC), and mineral associated C (MAOC) were greatly influenced by the management practice. Results showed thatTOC fractions under RM cropping system were significantly ($p \leq 0.05$) higher than that under RW. This difference in TOCis attributed to the fact that the higher residue biomass addition inthe RM system compared to that of the RW system. ZT practiceincreased the TOC over CT. Specifically,the ZT system increased TOC and its fractions at 0–5 and 5–10 cm soil depths, and CT improved the same at lower depth (10–20 cm) due to the inversion of crop residues during tillage. Higher C concentration and stock in different fractions were observed in the old alluvial soils (Inceptisols of Malda district) as compared to recent alluvial soils (Entisols of Coochbehar district), which was ascribed to higher residue biomass inputs and higher clay content in the Malda soils. Stratification of TOC concentration and its fractionsweremost apparent under the ZT than CT in the upper soil layers only, and higher in the soils of the old alluvium than that in the recent alluvium. All the C fractions except POC showed strong positive correlation (r= >0.85; $p < 0.01$) with TOC. We conclude that residue management practices in the conservation agriculture (CA) system affected the concentrations and stocks of organic C and its fractions along with its distribution in soils under different environments, tillage practices and cropping systems.

Keywords: Conservation agriculture, Tillage practices, Cropping system, Soil carbon fractions, Soil carbon stocks, Soil carbon stratification.

Poster Presentation Abstract

Agronomy for tall chickpea genotypes to enable mechanical harvesting

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ABSTRACT

The present-day tasks of agronomy derive from the necessity of satisfying the growing needs of the population for agricultural products. Among the different agronomic production technologies, optimum plant population and selection of appropriate genotypes suitable for mechanical harvesting for diverse growing ecosystems are important to increase the chickpea productivity by reducing the dependency on scarce labour. Genotype-based optimum planting density helps to efficiently utilize growth resources like soil, nutrients, and solar radiation. The optimum planting density depends on the type of genotype use (tall, erect, semi-erect, etc.) and its plant architecture to accommodate more plants per unit area. In this context, the present investigation was conducted to study the performance of tall chickpea genotypes indifferent plant densities under both irrigated and rainfed ecosystems at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Telangana, India for two consecutive years. The treatment consisted of four tall chickpea genotypes *viz.*, ICCV-11601, ICCV-11602, ICCV-11603, ICCV-11604 and one semi-erect genotype, JG-11 with three plant densities *viz.*, normal plant density (3.33 lakh ha^{-1}), 20 percent higher (3.99 lakh ha^{-1}) and 40 percent higher than normal (4.66 lakh ha^{-1}).The results indicated that planting semi-erect genotype JG-11 at higher density (40%) produced significantly higher seed yield under rainfed and irrigated ecosystems (2570 and 3048 kg ha^{-1}, respectively) compared to the rest of the interactions. Among the tall genotypes, the ICCV-11604 plantingat 40 percent higher plant density (2258 kg ha^{-1}) recorded on par seed yield with JG-11 at normal density (2299 kg ha^{-1}) under rainfed ecosystem, but under irrigated ecosystem, the former combination recorded significantly higher seed yield (2840 kg ha^{-1}) than planting JG-11 at normal density (2666 kg ha^{-1}) and on par seed yield with JG-11 at 20 percent higher plant density (2882 kg ha^{-1}). An increase in plant height in tall genotypes resulted in a correspondence increase in first pod height,

facilitating the machine harvesting with low harvesting losses (2.64 to 4.96%). Planting tall chickpea genotype ICCV-11604 at 40 percent higher density under irrigated ecosystem recorded a significantly higher net return of Rs. 62,058 ha^{-1} compared to JG-11 at normal density (Rs. 58,810 ha^{-1}) by minimizing the harvesting losses and cost under mechanical harvesting. The increase in planting density could compensate for the yield reduction in tall chickpea genotypes and facilitate mechanical harvesting to reduce the drudgery on scarce labour and save time and cost.

Keywords: Plant density, machine harvest, irrigated ecosystem, rainfed ecosystem, harvest loss.

Total Phenols, Flavonoids and Sugar content of Red, White and Krishnapuram Onion Bulbs

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Abstract:

Onion (*Allium cepa* L.), a member of Amaryllidaceae family, is one of the important export oriented vegetable crop cultivated across the World.Onion bulbs are in different colors due to the variation in the production of different flavonoids compounds like red anthocyanins, pale yellow flavones and bright yellow chalcones. Krishnapuram (K.P.) onions are internationally renowned because of having high-pungency and dark red color, which attracts foreigners and the entire production, is exported to the international market. White, red and K.P. bulbs were extracted in aqueous, methanol and ethanol solvents for estimation of total phenolic, total flavonoid and sugar content in the present investigation.Maximum total phenolic content was observed in ethanolic extracts of K.P. onion bulbs. High flavonoid content was monitored in aqueous K.P onion (212.09 µg g^{-1} FW) and minimum in methanolic extracts of red onions (112.89 µg g^{-1} FW). More sugar content was observed in aqueous extracts of K.P onion (288.34µg.g^{-1} FW) minimum in red onions (119.78 µg g^{-1} FW). Further investigation may help to understand specific characteristic of K.P.onion.

Keywords: Krishnapuram onion, Flavonoids, Phenols, Sugars, Methanol

BIOFERTILIZER - A COST REDUCTION PRODUCT TECHNOLOGY

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Biofertilizers or Bioinoculants are products containing living organisms such as nitrogen fixers, phosphorus solubilizers, phosphorus mobilizers,potassium solubilisers and zinc solubilisers which are useful for agricultural production. Biofertilzers play a significant role in improving soil fertility and plant growth by fixing atmospheric nitrogen both in association with plants and without plants, solubilizes insoluble soil phosphates into soluble phosphates there by increasing their availability of phosphorus, secrete growth promoting substances and supplies to the inoculated plants. Rhizobium belongs to rhizobiaceae family which symbiotically fixes the atmospheric nitrogen. Rhizobium establishes symbiotic relations with pulses and other legumes and fix 50-100 kg N ha^{-1} by which application of chemical nitrogen fertilizers could be reduced and supplemented. Azotobacter belongs to azotobacteriaceae family, which is chemoautotrophic in nature, free living, non-symbiotic and is recommended for application to non-legume crops. It grows best in neutral to alkaline soils. By the application of azotobacter to various crops, the amount of recommended doses of nitrogenous fertilizers can be reduced by 10-20% and also yield increase in 10-15% was noticed in some millets. Azospirillum belongs to spirillaceae family, chemoautotrophic and associative in nature. It is an associative nitrogen fixing organism was found to be beneficial for sorghum, wheat, maize, barley, fodder grasses and minor millets. By the application of azospirillum, 20-30% kg $ha^{-1}$of nitrogen fertilizer dose can be reduced.A recent estimate revealed that 49.3 per cent of cultivated lands are deficient in available phosphorus. The added fertilizer phosphorus gets fixed in soil and it is not available to the crops. Therefore, primary approach in agronomic management of phosphorus is to scavenge the native/fixed phosphorus and also to overcome the fixation of applied phosphorus fertilizer. The low cost practice to activate this objective is to inoculate soil with the phosphorus solubilizing fungi and bacteria.. Several soil fungi, particularly those belonging to the genera Penicillium and Aspergillus possess ability to bring insoluble soil phosphates into soluble forms by secreting weak organic acids such as formic, acetic, propionic, lactic, glucolic, fumaric and succinic. It is known that potassium solubilizing bacteria (KSB) can solubilize K-bearing minerals and convert the insoluble K to soluble forms of K available to plant uptake. Many bacteria such as *Acidothiobacillus ferroxidans*, *Paenibacillus spp.*,*Bacillus mucilaginous*, *B.edaphicus* and *B.circulans* have capacity to solubilize K minerals. Similarly ,*Pseudomonas fluorescence*, *Burkholderia cenocepacia*, *Serratia liquefaciens*, *S. maracescens* etc., solubilizes the complex zinc compounds and making zinc available to the plants.

Key words: Biofertilizers, nitrogen fixers, phosphorus solubilizers, phosphorus mobilizers, potassium solubilisers and zinc solubilisers.

GUMMOSIS- A disease complex of various pathogens and its molecular mechanism of pathogenesisare necessary for disease management practice.

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Abstract

Gummosis is the formation of patches of a gummy substance on the surface of certain plants, particularly fruit crops. Gummosis is thought to be induced by biotic (Fungus, bacteria, virus) and abiotic causes (insect attack, mechanical and chemical injury, water stress or other environmental stresses). Gummosis occurs invarious plant species like stone fruits, citrus fruits plantation crops, medicinal as well as ornamentals.A recent study has revealed gummosis as a syndrome caused by complex of many fungi like*L. theobromae, Botryosphaeria sp., Neofusicoccum austral*, *N. parvum*and*Phellinus* sp. However, gummosis is basically regarded as a defense mechanism activated when a plant is under biotic or abiotic stress. Although a molecular mechanism behind the pathogenesis remain unclear. It was seen there is an overall change of gene expression in defense response and glycometabolism which might result in the gummosis of peach trees induced by *L. theobromae*. Many workers have also reported that an exogenous application of Ethylene can induce gummosis in tulip. Being a disease complex and number of factors associated to cause this disease, an appropriate management practice is needed to combat this serious problem. Various workers have managed the disease at a good level by the integeration of cultural biological and chemical methods. However maximum disease management 49.5 % was observed with treatment of streptocycline @ 500 ppm Results of different treatments on gummosis disease severity of apricot clearly indicate that all the treatments significantly decreased the disease severity over time. .

Keywords: Gummosis, disease complex, abiotic and biotic stress, pathogenesis,cultural biological and chemical methods.

Microsatellite marker based genetic diversity of *Venturia inaequalis* (cke.) Wint. in mixed orchard system of Kashmir

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ABSTRACT

Apple scabis a successful parasite on apple because it has accumulated numerous parasitic fitness attributes (genes) that enable it to infect and reproduce.In Kashmir diminutive work has been carried out on population genetics of *V. inaequalis* and no information is available on population structure in mixed orchard system which necessitates working out the genetic diversity in mixed orchard system of Kashmir. Molecular diversity using ten microsatellite markers revealed a high level of polymorphism and similarity coefficients ranged from 0.00 to 1.00. In cluster analysis, thee clusters (cluster I, cluster II and cluster II) with different isolates were obtained irrespective of their geographical origin, cultivar or host species and indicating a high level of genetic diversity in *V. inaequalis*. Isolates formed a number of haplotypes indicating a high level of genetic diversity in *V. inaequalis* in Kashmir valley. Analysis of molecular variance using microsatellite markers also revealed a high level of variability within populations (geographical location, cultivar or host) than among the population. Pairwise F_{ST}(fixation index) values at 2 and 3 population level were low (0.02 – 0.04) revealing less genetic differentiation among the *V. inaequalis* populations. However, fixation index values (0.06 – 0.36) were moderate to very high among the 18 *V. inaequalis* populations indicating significant genetic differentiation. The clustering algorithm supported two clusters (K= 2).It is evident from the present study that gene flow is prime factor responsible for shaping or structuring populations of *V. inaequalis* in Kashmir valley. Due to strong selection against immigrantsi.e. host specificity from different host varietieswill have important implication on the use of mixture in practice for management of scab.

Key words: Apple scab, *Venturia inaequalis*, *Malus* x *domestica*, SSR markers, Genetic diversity, Population genetics, host-pathogen interection

Participation Abstracts

PHARMACOGNOSTIC EVALUATION OF *SPHAGNETICOLACALENDULACEA* (L.) PRUSKI. LEAVES

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ABSTRACT

Sphagneticola calendulacea (L.) Pruski. is a crawling evergreen weed. It is commonly known as Creeping Daisy, Bhringaraja, Pita bhringi etc. This plant has adequate medicinal properties. The plant is mainly used for the treatment of inflammations, including abscesses and sore throat; it is also used to treat coughs. The fresh plant, combined with sesame oil, is used to treat elephantiasis. The leaf extract is used in alopecia. For standardization of this herbal plant Pharmacognosy is carried out. The leaves of the said plant is studied for the parameters like macroscopy, microscopy, histochemistry and powder study. It was also investigated for physicochemical, fluorescence and phytochemical analysis. The powder study revealed the presence of animocytic stomata, palisade tissue, tannin filled cell, starch grains, calcium oxalate crystals, oil globules and trichomes. These results go concurrent with microscopy of leaves. The physicochemical parameters showed total ash 20%, acid insoluble ash 9%, water soluble ash 14%, water soluble extractive value 8% and alcohol soluble extractive value 4%. The phytochemical test and histochemical analysis showed the presence of carbohydrates, tannins, lipids, saponins, pectin, etc. Thus these parameters will be useful in authenticating the plants.

KEYWORDS: *Sphagneticola calendulacea*, leaves, Pharmacognosy, phytochemical analysis

Pharmacognostical investigation of *Clitoriaannua*var. *emarginata*. S.R.Yadav&Dhanke - Leaves

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ABSTRACT:

In recent years, the world population has started orienting towards herbal medication. Indian is the center for such conventional knowledge. Since the population is switching towards herbal drugs, the standardization of such drugs necessary. *Clitoriaannua* var. *emarginata*. S.R.Yadav&Dhanke is traditionally called as Surguja / Charo / Jungle-wal is indigenous to India. The plant is endemic to Maharashtra, Gujarat and Rajasthan. The leaflets are known for its hepatoprotective activities. For the first time Pharmacognostical investigation will be carried out for the leaves of said plant. The study involves various parameters such as Macroscopy, to understand the external morphology. The Microscopy and Powder study to identify the cell and their inclusions, which concluded the presence of sclerenchyma ring around vascular bundles, Xylem with spiral thickening, two types of trichomes i.e, straight, warty, blunt bicellular trichomes and curved, smooth, pointed bicellular trichomes. Physicochemical and Fluorescence analysis, were also done. The physicochemical studies revealed i.e. moisture content (7.14 %), total ash (9.40 %) water soluble ash (6.98 %), acid insoluble ash (2.15 %), water soluble extractive value (6.09 %). and alcohol soluble extractive value of (7.25 %). The Phytochemical and histochemical studies, diagnosed the presence of metabolites like, alkaloids, starch, carbohydrates, proteins, glycosides, etc.

Key words: *Clitoriaannua*var. *emarginata*, leaves, pharmacognosy, Phytochemistry.

Wild Relatives: Source ofCrop Improvement in Barley (*Hordeum vulgare* L.)

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Abstract

Barley together with emmer wheat was the first cereal to be domesticated in the Middle East, at least 9000 years ago. Over the course of domestication, barley grain morphology changed substantially, moving from an elongated shape to a more rounded spherical one. Additionally, wild barley has distinctive genes, alleles, and regulators with potential for resistance to abiotic and biotic stresses to cultivated barley and adaptation to climatic changes.The main objectives of barley breeding are to development of high yielding cultivars with grain quality, tolerant of abiotic and biotic stresses.The several breeding methods including pedigree, bulk, backcross and single seed descent method have been successful for development of superior cultivars.The wild barley *Hordeum spontaneum* is progenitor species of *Hordeum vulgare* and crosses readily with cultivated barley (Helback, 1966; Harlan, 1975). *Hordeum vulgare* is the only cultivated species which has two distinct phenotype forms,*viz.*, two-rowed and six-rowed types based on earmorphology, which have same chromosome number, intercross freely and produce fertile hybrids (Poelman,1987).The interspecific hybridization of cultivated barley (*Hordeum vulgare* L.) with *H. bulbosum* L. was reported in 1970s (Kasha and Kao, 1970). This wild species has desirable traits, such as disease resistance, that are worthwhile transferring to its cultivated relative. Progress has been achieved through developing partially fertile interspecific hybrids that have been selfed or backcrossed to barley.Resistance to leaf rust and powdery mildew recombinant line has been derived from the crosses between *H. vulgare and H. bulbosum (*Aleksandra *et.al.2019).*The drought, salt tolerant gene andquantitative trait loci (QTLs) have been identified in wild barley *Hordeum spontaneum. Hordeummurinum* and *Hordeum marinum* had lower grain yield but relatively higher yield stability under different environments.The introgression of wild alleles and quantitative trait loci (QTLs)may enable for biotic, abiotic stress and biofortificationfor barley crop improvement.

Keywords:-wild relatives, QTL, biofortification.

Evaluation of population biology of mycoflora in rhizosphere microbiome of rice

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ABSTRACT

The rhizosphere is a hot spot of microbial interaction as exudates released by plant roots are the main food source for microorganisms and battlefield for soil-borne pathogens and beneficial microbes (Raajimakers 2009). A region in which a wide range of microorganisms are beneficial to plants such as plant growth-promoting bacteria and fungi and also inhibit the growth and development of other harmful microbes (Kumar *et al*., 2020). The complex rhizosphere is a zone of plant roots and soil mixture where both microflora and microfauna, interact with soil-borne pathogens and influence the outcome of pathogen infection. The present investigations were conducted to assess the population biology of mycoflora that thrived in rhizosphere zone of rice of Guru Kashi University, farm fields. The mycoflora was isolated following the serial dilution plating technique. On the basis of morphometric and cultural characterization the obtained fungal isolates from the rhizosphere soil of rice were *Aspergillus* spp., *Alternaria* spp., *Curvularia lunata*., *Fusarium* spp., *Helminthosporium* sp., *Penicillium* spp., and *Ustilaginoidea virens*. Some genera such as *Aspergillus* spp. and *Penicillium* spp. were found highly dominant in rhizosphere zone due to their fast growth and production of aflatoxins and antibiotic penicillin, respectively. The observed data revealed that the number of fungal flora in the rhizosphere soil of rice 4 to 8 (per gm), are more favorable for growth due to suitable temperature and exudates as food sources released by rice roots as compared to other plants roots. The results of investigation indicate that the number and frequency of fungal flora depend upon the favorable rhizosphere environmental conditions and such type of fungal flora can be beneficial to plants as plant growth-promoting fungi in rhizosphere microbiome.

Keywords: Rhizosphere microbiome, Mycoflora, Population biology, Rice rhizosphere

Site-specific nitrogen management in different rice establishment systems

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ABSTRACT

There is a need to study nitrogen management in rice with the concept of site-specific nutrient management (SSNM). These approaches need thorough testing or investigating different rice establishment systems. In rice, SSNM based nitrogen management can be an important approach that can answer when, where, and how much to apply nitrogenous fertilizers and its combination with other nutrients, synchronizing it with crop demand, to acquire maximum yield threshold level, reducing environmental harms. In view of these facts, a field experiment was conducted at the College of Agriculture, UAHS, Shivamogga, for two years in sandy loam soil of low nitrogen status. In the present study, as a part of site-specific nitrogen management like soil test crop response approach (STCR), soil test based fertilizer recommendations (STL), leaf colour chart (LCC) were tested over recommendation dose of fertilizer (RDF) for different systems of establishment *viz.,* system of rice intensification (SRI) and aerobic against conventional. The results indicated that the growth and yield parameters were better in SRI than the aerobic and conventional methods. Thereby achieved significantly higher grain (7767 kg ha^{-1}) and straw yield (8878 kg ha^{-1}) in SRI. Among different nitrogen management approaches, the STCR approach with a target yield of 80 q ha^{-1} recorded significantly higher growth and yield components, chlorophyll content and nutrient uptake as compared to RDF, STL and LCC approach. As a result, significantly higher grain and straw yield (7182 and 8313 kg ha^{-1}) were realized in the STCR approach as compared to RDF (6196 and 6976 kg ha^{-1}), STL (6392 and 7588 kg ha^{-1}) and LCC approaches (6784 and 7697 kg ha^{-1}). The treatment combination of SRI with STCR recorded higher grain and straw yield (8348 and 9479 kg ha^{-1}) followed by the conventional system with the STCR approach (7921 and 8977 kg ha^{-1}) and SRI with LCC approach (7914 and 8960 kg ha^{-1}). It is concluded that the SRI system of rice establishment with STCR approach of nitrogen management found best to obtain higher growth, nutrient uptake, productivity and net returns in rice farming.

Studies on life tables for *Chilo partellus* (Swinhoe) on maize

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Abstract:

studies on life tables for *Chilo partellus* (Swinhoe) on maize was carried out during 2010-11 and 2011-12 in the Department of Agricultural Entomology, University of Agricultural Sciences, Dharwad, Karnataka, India. The study on life table was undertaken with some modification over the method suggested by Harcourt (1961). Three stages *viz*., egg, larva and pupa were chosen for sampling *C. partellus*. The results indicated that, twelve life-tables were constructed for *C. partellus* (from 2010 to 2012). Totally four parasitoids were recorded on *C. Partellus*.. Major mortality factors influencing population fluctuation included parasitoids and unknown causes. Among the parasitoids, *Cotesia flavipes* was the dominant species on larval stage. The mortality rate was higher at the early stage intervals (egg and larva). The egg mortality was very high in both the years. The generation survivability declined rapidly from I generation to VI generation. Key factors influencing the overall mortality was due to the larval mortality in LP age interval. The factors mainly responsible for mortality were parasitisation by *C. flavipes*.

***Key words*:** maize, *Chilo partellus*, life table, *Cotesia flavipes*

Transgenesis: A biotechnological approach for GM crops in Plant Pathology

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Abstract

Genetic modification in plants was first recorded 10,000 years ago in Southwest Asia where human first bred plants through artificial selection and selective breeding. Since then, advancements in agriculture science and technology have brought about the current GM (Genetically modified) crop revolution.Genome sequencing of several organisms has resulted in the rapid progress of genomic studies. Genetic transformation is a powerful tool and an important technique for the study of plant functional genomics, *i.e*. gene discovery, new insights into gene function, and investigation of genetically controlled characteristics. In addition, the function of genes isolated using map-based cloning of mutant alleles has been confirmed by functional complementation using genetic transformation. The cultivation of genetically modified crops is becoming increasingly important more traits are emerging and more acres than ever before are being planted with GM varieties. The release of GM crops and products in the markets worldwide has increased the regulatory need to monitor and verify the presence and the amount of GM varieties in crops and products. Gene transformation and genetic engineering contribute to an overall increase in crop productivity. The current growth rate of the GM seed market at 9.83–10% CAGR along with promising research avenues in biofortification, precise DNA integration and stress tolerance have forecast it to bring productivity and prosperity to commercial agriculture.

Keywords: Genetically modified,gene, technique,transformation

Evaluation of finger Millet germplasm for blast resistance.

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Abstract

Finger millet blast is the most devastating disease affecting different aerial parts of the plant at all growth stages starting from seedling to grain formation.The average loss due to blast has been reported to be around 28- 36%, and in endemic areas, it has potential to cause severe crop losses when environmental conditions are favorable for disease development and yield losses up to 90% was recorded. Effective management of blast disease in finger millet can best be achieved through host-plant resistance. Growing disease resistant varieties is most relevant and cost effective for the resource-poor and marginal farmers, who cannot afford other method of disease control such as using expensive chemical fungicides. In this regard, the finger millet germplasm maintained at Agricultural Research Station, Perumallapalle was evaluated for blast resistance under artificial inoculation conditions during 2018-19. Each test entry was planted in two rows of 3m each and five entries Sandwiched with blast susceptible variety, VR-708. The blast inoculum multiplied on finger leaf bits were sprayed over the crop at tillering and pre-flowering stage to create disease pressure. Among 215 entries tested, IE-3704, PCGF-44, IE-3165, VR-963, PR-22 have shown resistant reaction to both neck blast(5.55%, 6.48%, 2.22%, 3.44% respectively) and finger blast (9.44%, 9.09%, 7.53% and 9.14% respectively) as against susceptible check with 69.71% neck blast and 56.12% finger blast incidence.

Keywords: Finger millet, Blast disease, management, Host-plant resistance.

LONG TERM EFFECT OF ORGANIC MANURES ON YIELD ANDSOIL FERTILITY OF SUGARCANE IN SOUTHEN ZONE OFANDHRA PRADESH

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ABSTRACT

A field experiment on organic Forming Research in Sugarcane under Alfisols of Southern Zone was initiated at Agricultural Research Station, Perumallapalle from 2011-2012 onwards with two packages i.e., T_1 : Organic Farming and T_2 : Inorganic Farming (224-100-112 kg N-P_2O_5-K_2O ha^{-1}). Test variety was 2005 T 16. The results revealed that cane yield increased in organic farming from 95 t ha^{-1} (2012-13) to 107 t ha^{-1} (2017-18) which indicates 12.6% increase in cane yield with continuous application of organic manures over 5 year. Cane yield recorded in inorganic farming was 105 t ha^{-1} during 2012-13 and increased to 113 t ha^{-1}during 2017-18 indicated 7.6% yield increase Jaggeryyield increased from 11.49 to 12.35 t ha^{-1} in organic farming and 13.37 to 13.59 t ha^{-1} in inorganic farming. Soil organic carbon status was gradually increased from its initial value in both the treatments, however more increase was observed in organic farming than inorganic farming. Organic carbon content increased to 0.48% in organic farming and 0.47% in organic farming during 2017-18 from its initial value of 0.34% (2011-2012). Build up of available N was observed in both the treatments from its initial value of 206 kg ha^{-1}, during first year build up was low in organic farming (217 kg ha^{-1}) than inorganic farming (248 kg ha^{-1}). After six years, more nitrogen build up was recorded in organic farming than treatments and more increase was observed in organic farming in majority of the years Available potassium also followed the same trend except first year, higher value was recorded in inorganic farming, later organic farming recorded high available potassium status than inorganic farming, later organic farming recorded high available potassium status than inorganic farmin. Buildup of available nutrients i.e., 29.12% of status available N, 72.83% of available P_2O_5, 2.81% of available $K_2O$was recorded in organic farming, where as in inorganic farming it was 15.53% of available nitrogen and 63.15% of available phosphorus, no change in available potassium from its initial status.

Keywords: Sugarcane, Organic farming, Soil fertility and Alfisols.

CANE YIELD, NUTRIENT UPTAKE AND SOIL FERTILITY AS EFFECTED BY APPLICATION OF TRASH IN DIFFERENT METHODS

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ABSTRACT

Retention of sugarcane trash (dry leaves) in the field potentially has several effects both positive and negative. Burning can be detrimental to soil structure and nutrient availability due to loss of soil organic matter. If sugarcane trash is retained as mulch since from harvesting it makes difficult to carryout ratoon management practices. Hence if the trash can be converted in to small pieces by trash shredder, it helps for easy incorporation into soil and fast decomposition when compared to mulching with sugarcane leaves. Keeping this in view a field experiment was conducted during 2018-19 to study the influence of manures and chemical fertilizers on yield of sugarcane and soil fertility after harvest at Agricultural Research Station, Perumallapalle, ANGRAU. The experiment was laid out with four treatments viz., Control, Burning the trash, Trash mulching and Trash spreading by trash shredder. Variety 2005 T 16 was planted in three replications. Plant samples were collected at 90 days after planting (DAP), 108 DAP and harvest to determine nutrient uptake. Cane yield and juice quality parameters were recorded at harvest. Results revealed that the N, P and K uptake was significantly affected by different treatments at all stages of crop growth except P and K uptake at 90 DAP. During all the stages application of trash by trash shedder recorded higher N, P and K uptake which was at par with trash mulching. The cane yield and cane length were also significantly affected by treatments. Higher cane yield was recorded with trash shedder (132 t/ha) it was on par with trash mulching expt. (127 t/ha). The treatments should non significant effect on juice quality parameters. Higher 13°C ratio also recorded with trash shedder except. Among the soil properties, OC, avail N, P_2O_5 and K_2O were significantly affected by treatments. Significantly highest OC and avail K_2O were recorded with trash shedder treatment (0.53% and 244 kg/ ha^{-1} respectively) followed by trash mulching (0.50% and 223 kg/ha, respectively). Though higher N and P_2O_5 were recorded with trash shedder treatment it is on par with trash mulching. Build up of available N, P_2O_5 was observed in soil after harvest when compared with initial value. Water holding capacity was also significantly affected by treatments. Significantly highest WHC (40.08%) was recorded in the plot where trash incorporated by trash shredder. Significantly highest microbial population (total fungi, bacteria and actinomycetes) were also observed in trash shredder plot than others.

Keywords: Sugarcane yield, cane trash, soil fertility, microbial population and nutrient uptake.

Microclimatic variation in millet and oilseed intercropping under rainfed conditions

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Abstract

In an intercropping system, millets grow fast and produce foliage that provides shade over the soil during the initial stage of crop growth, which reduces light transmission on the component crop as the amount of light intercepted by the component crop in an intercropping system depends on the geometry, row proportion of the crops arranged and foliage architecture. This leads to changes in the crop microclimate, which have a direct influence on plant growth and development and resource utilization, as well as pest and disease incidence, predator population and synergistic effect. There is no recommendation of millet and oilseed intercropping systems with row proportions for the Northern Dry Zone of Karnataka under dryland conditions. Therefore, there is a need to identify the suitable millet and oilseed intercropping systems and assess the microclimatic modifications in the intercropping systems as influenced by different row proportions under rainfed conditions. By keeping these points in a view a field experiment was conducted to know the crop-weather relationships under different row ratios in millet and oilseeds intercropping at the Regional Agricultural Research Station farm, Vijayapur, Karnataka, during *Kharif* 2019. The experimental site is situated at $16^0$55' North latitude and $75^0$43' East longitude with an altitude of 594 meters above mean sea level. It is necessary to understand the knowledge of plant environment interaction for increasing yield of crop. The present experiments were designed to study the crop weather relationship in millet and oilseed intercropping systems. The experiment was laid out in a randomized complete block design (RCBD) and replicated thrice. There were sixteen treatment combinations, including niger and sesame intercropping in 1:2, 3:3 and 2:4 row ratio with foxtail millet and little millet under replacement series. Foxtail millet + Niger (2:4) recorded significantly higher grain yield (762 kg ha^{-1}) in foxtail millet intercropping treatments and Little millet + Sesame (2:4) recorded significantly higher grain yield (562 kg ha^{-1}) as compared to other intercropping systems in little millet intercropping treatments. In millets, grain yield (r=0.30*) and total dry matter production (TDMP) (r=0.45*) had a highly significant positive correlation with weather parameters such as light absorption ratio (LAR) and significant negative correlation with soil temperature (r= -0.34*). The variation in grain yield was primarily affected by average maximum temperature followed by higher soil moisture content, relative humidity, canopy air temperature and wind speed during sowing to maturity and lower variation was observed in average relative humidity during maturity. In oilseeds, leaf area index (LAI) significant positive correlation with LAR (r=0.57*). The LAI of oilseeds (r= 0.97*) were strongly correlated with TDMP and grain yield values. The grain yield of oilseeds was also significantly positively correlated with TDMP (r= 0.99*). The soil moisture content in oilseeds significantly negatively correlated with soil temperature and LTR. From the present findings it can be inferred that foxtail millet + niger (2:4) can be a better option to get higher productivity in Northren dry zone of Karnataka.

Key words: Microclimate, Oilseeds, Intercropping, Row ratio, Correlation, Light transmission ratio, Leaf area index.

Performance of millet and oilseed based intercropping systems in shallow vertisols of Northern Karnataka

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Abstract

Either sole millet and oilseeds are not remunerative to the farmers; therefore, farmers were not practicing widely. The intensification of millet and oilseed intercropping system is an alternative to increasing the area of these crops and system productivity and farmers income. There is no recommendation of millet and oilseed intercropping systems with row proportions for the Northern Dry Zone of Karnataka under dryland conditions. Keeping these points in view, a field experiment was conducted at Regional Agricultural Research Station, Vijayapur, Karnataka in *Kharif* 2019 to evaluate the productivity and profitability of millet and oilseed intercropping with row ratio under dryland conditions. The experiment consisted of 16 treatments, including niger and sesame intercropping in 1:2, 3:3 and 2:4 row ratio with foxtail millet and little millet under replacement series. Improvement in plant height, total dry matter production (TDMP), grains weight per 0.5-m row length, thousand-grain weight were observed in sole cropping than their intercropping. The plant height of millet and oilseed crops was relatively less in the sole than intercropping systems. The total dry matter production (TDMP) of sole foxtail millet and little millet was higher than intercropping systems. Among the intercropping systems, foxtail millet + niger (2:4) recorded significantly highest plant height, total dry matter production, grains weight per 0.5-m row length (93.3 g), thousand grain weight (3.41 g) over sole foxtail millet and little millet. The maximum yield foxtail millet was recorded in intercropping with niger in 2:4 row ratio (762 kg ha^{-1}), little millet in intercropping with sesame in 2:4 row ratio (562 kg ha^{-1}). The significant higher system productivity in foxtail millet + niger (2:4) (2793 kg ha^{-1}). Foxtail millet equivalent yield was higher in niger intercropping with foxtail millet in 2:4 row ratio and in foxtail millet intercropping with niger in 2:4 row ratio. The recorded foxtail millet equivalent yield was highest in foxtail millet + niger with 2:4 row ratio (1916 kg ha^{-1}) followed by foxtail millet + niger with 1:2 row ratio intercropping system. The net returns, economic efficiency and benefit-cost ratio was higher in foxtail millet intercropped with niger in 2:4 row ratio (28,642 Rs ha^{-1}, 318 Rs ha^{-1} and 2.65, respectively) followed by foxtail millet + niger in 1:2 row ratio. Similarly, the land equivalent ratio, area time equivalent ratio and land equivalent coefficient was higher higher in foxtail millet intercropped with niger in 2:4 row ratio (1.33, 1.26 and 0.42, respectively) followed by foxtail millet + niger in 1:2 row ratio. Therefore, we conclude that the foxtail millet + niger (2:4) intercropping systems is a profitable intercropping systems for Northern Dry Zone of Karnataka.

Key words: Intercropping, Row ratio, Land equivalent ratio, Area time equivalent ratio, System productivity, Economic efficiency, oilseeds

Hypoxic and post hypoxic induction of NAD+ alcohol Dehydrogenase and superoxide dismutase of Zea mays L. seedlings

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ABSTRACT

The present investigation was undertaken to investigate the behavior of NAD+ alcohol dehydrogenase and superoxide dismutase during hypoxic and post hypoxic conditions and the results were compared with anoxic and post anoxic conditions to get some information about the mechanism of tolerance of some maize varieties during such stress conditions. A maximum of five-fold increases in specific activity of alcohol dehydrogenase was recorded in hypoxic root samples of**Suwan**and **Laxmi** varieties as compared to control values whereas the root samples of these varieties did not show any significant increase in specific activity of this enzyme during anoxia when compared to the irrespective controls. The roots superoxide dismutase activity exhibits two folds enrichment of specific activity during hypoxic and three folds during post hypoxic as compared to control values, but no such enrichment of enzyme activity was observed during anoxic and post anoxic root samples of **Suwan**. Whereas, in**Laxmi**, there was approximately three-fold increase in specific activity of root superoxide dismutase during hypoxia/anoxia, but no such increase of enzyme activity was observed during post hypoxia/anoxia. Since this enzyme was known to play the major role in eliminating superoxide radicals which could be generated in high concentration during reaeration. Therefore, the induction of superoxide dismutase may be well correlated with the tolerance of different maize varieties during such specified conditions of stress. The present data show that the mechanism operative during hypoxia and anoxia are of different nature and also variety specific. Therefore, it can be concluded that **Suwan is** more tolerant to these specified stress conditions than the chlorophyll and carotenoid data also confirm the same hypothesis.

Keywords: Suwan, Laxmi, Reaeration, Superoxide radicals, Carotenoid

FREE RADICAL GENERATIONS AND THEIR ELIMINATION DURING OXIDATIVE STRESS IN PLANTS

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ABSTRACT

Aerobic life started some 3.5 b years ago when the precursors of our cyanobacteria 'invented' photosynthetic O_2 evaluation at the expense of water by developing photosystem II. Thus, very slowly, the atmosphere becomes aerobic allowing the consumption of O_2 as a final electron acceptor during respiration eventually replacing nitrate-based respiration. Oxygen$_2$ is directly involved as substrate or product in several enzyme catalyzed reactions and its reactivity resides in its electronic configuration. Oxygen atoms or molecules, each have two unpaired electrons therefore both are free radicals. These free radicals are not as reactive as their status implies, it is the one unpaired electron form of oxygen, i.e., superoxide (O_{2^-}) OR ITS protonated form (HO^0.), which is widely associated with O_2 reactivity (toxicity) in biology and are termed as reactive oxygen species (ROS). Reactive oxygen species inactivate enzymes and damage important cellular components i.e., Lipid, Protein, DNA, Fatty acid etc. The increased production of toxic oxygen derivatives may be considered to be a universal and common feature of stress conditions. This toxicity is reflected by their short half-lives before reacting with cellular components as compared to that of dioxygen (>100 Sec.). There are mainly three intermediates of univalent reduction of dioxygen to water. i) Superoxide ($O_{2^{0-}}$) ii) Hydrogen peroxide (H_2O_2) iii) Hydroxyl radical (HO^0) All are chemically reactive and biologically toxic. Once formed the reactive oxygen species must be detoxified as efficiently as possible to minimize damage. Antioxidative defense systems are important in limiting oxidative damage and in destroying active oxygen species that are produced in excess of those normally required for metabolism. Furthermore, the conditions favoring oxygen radical generation like low energy charge, high reducing equivalent level and saturated electron transport components usually exist in aerobic tissues causes "Oxidative stress". Is an important abiotic stress in the natural and agriculture environment imbalance in any cell compartment between production of reactive oxygen species and antioxidative defense.

Key words: Precursors, Catalyzed, Univalent, Antioxidative, Oxidative Stress

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