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3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during year

Supporting Documents

Sr. No	Name of the teacher	Title of the book/chapters published	Year of Publication	Page no
1.	Dr. Bhagwat Chavare	Wild botanicals as an alternate source offodder for domestic animals in drought hit Marathwada region of Maharashtra	2018-2019	1-5
2.	Dr. Bharthi Dhondge	**BOOK**- Nasira Sharma Ka Katha Sahitya sanvedna aur shilp **Translated title of Book** : Sensation and Craft of fiction by Nasira Sharma	2018-2019	6-12
3.	Dr. V.B.Sonawane	Current Views on Biological Science -Rhizosphere Mycoflora	2019-2020	13-18
4.	Dr. Bhagwat Chavare	Mycoremediation: An Effective Tool toDecontaminate Environment:A Review	2019-2020	19-27
5.	Dr. V.B.Sonawane	Ecosystem Management & Conservation	2020-2021	28-33
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CHAPTER - 23

WILD BOTANICALS AS AN ALTERNATE SOURCE OF FODDER FOR DOMESTIC ANIMALS IN DROUGHT HIT MARATHWADA REGION OF MAHARASHTRA

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Abstract

Marathwada is an ever drought hit region of Maharashtra state faces severe drought conditions in all districts. Majority of the population of region depends on agriculture and allied businesses since there is very limited industrialization and developments took place. Farmers of the area with their agricultural practices used to raise domestic animals like, cow, Buffalos, goats and ships for the purpose of milk and continuous money generation. But adverse drought conditions in the region may lead to cease their practice in summer season due to lack of fresh forage crops. A survey was undertaken in the drought hit region in different periods of the year and observed that, in winter and summer season, there is acute water scarcity in the region does not allow local people to grow green forage crops. People feed their animals on the foliage of various wild plants grown in the area. This became an alternative fodder source for the domestic animals which saves animals from starvation and farmers from inconvenience. Plants like, *Acacia Arabica, Cocculus hirsutus, Ficas religiosa, Melia azadirach, Tinospora cordifolia, Ziziphus mauritiana* etc are widely utilized for the purpose. But due to uncontrolled wood cutting in the area for various purposes leading to threaten this important alternative too. Government, NGO's and farmers in the region should look after the matter seriously.

Keywords: Botanicals, Fodder, Domestic Animals, Drought hit, Marathwada

Introduction

Agriculture and domestic animals are vital contributors to majority of rural population of India for their livelihood. Farmers of the country look after livestock rising as a supplementary earning source. India has highest livestock population in the world, which having 18 percent share and a growth of 2.35 % (Bakshi et.al, 2004). Major livestock animals include, cows, buffalo, bullock, goat and sheep. Cow and buffalos are the animals raised for the purpose of milk; Bullock is highly used for various agricultural activities like ploughing and transportation whereas sheep and goats are mainly raised for the purpose of wool and meat production. Besides this, dung and excreta of all the above animals is highly useful as dung manure for different agricultural crops.

Rapidly growing population and changing life standard are the main reasons behind increasing demand for food of animal origin in developing countries (Dikshit and Birthal, 2010).

Adequate and nutritious feed provision is an essential aspect for successful rising of livestock. But day by day due losing fertility of soil and adverse environmental conditions are causing acute scarcity of animal feed which is becoming a limiting factor for livestock culture. In India, per capita milk production is very less due to the unavailability of adequate and nutritious feed stuffs. Very few farmers of India cultivate fodder crops in their field intentionally

for domestic animals. Majority of farmers use crop residues and other allied plant parts to feed their animals.

These secondary crop products are proved less nutritious and will not show remarkable growth of animals. Some farmers leave their livestock for grazing in open uncultivated fields and forests which sometimes creates many regulatory conflicts.

Marathwada is a region of the Indian state; Maharashtra comprises total eight districts including Aurangabad, Jalna, Parbhani, Hingoli, Osmanabad, Beed, Nanded and Latur. Main occupation of the farmers residing in all eight districts is agriculture. Because there is very limited industrial and corporate development took place in the region. All districts face acute draught conditions every year which affects adversely on the agricultural yields, drinking water and many other activities like rising of livestock. According to government records, 422 farmers in Marathwada committed suicide in 2014. This was because of their inability to bear crop losses and a financial quandary made acute by water scarcity and an agrarian crisis. 2014 was the third consecutive year of low rainfall, and when rainfall did occur it was sometimes untimely and damaged crops. Of the 422 suicides, 252 cases were due to an inability to repay agricultural loans. There have been more than 117 farmer suicides in the first two months of 2017. According to a study by IIT Bombay, the severe or extreme droughts have frequently occurred in major portions of Marathwada, in the last few decades.

Still Marathwada is affected by frequent anomalies in rainfall during Monsoon season, farmers of the area raise livestock including cow, buffalo, bullock, goats and ships which require frequents and large quantity of fodder every year. Changing crop patterns in the area, badly affected on the proportion of fodder crop plants. Because in old days farmers were cultivating, Jowar, Hybrid Jowar, Maize and other types of fodder producing crops on the large field area. But in recent years farmers turned towards the cash crops which produce very less quantity of fodder such as, Soyabean, Cotton, Watermelon, and some vegetables crops. So there is a remarkable decrease in the number of livestock in the area. Recently in the year 2018, Marathwada region received very less rainfall so farmers of the region could cultivate crops in the kharip season only, proportion of that too was very less. Very rare number of farmers who having water source in their farm could sow seeds in Rabbi Season. So condition of fodder in the region becomes so worst. Many farmers sold their livestock at a very low cost in the animal market.

In such worst conditions some farmers reared animals like cow, buffalo and goats by feeding them with some wild plants which having good and adequate foliage on it. Such wild plants become a boon for the livestock of the area. In the present paper author tried to gather information of such an important plants which not only an alternative for the fodder but proved to be nutritious and healthy for the domestic animals.

MATERIALS AND METHODS

Fodder is a primary requisite of the domestic animals which affects on growth of animals and also impacts productivity. Farmers and cattle owners in Marathwada were visited in different seasons and information was collected from the cow, buffalo, bullock, sheep and goat owners regarding the fodder they use to feed to their animals. In rainy and winter season farmers use different type of green forage crop leaves and some wild plant leaves due to availability of adequate water. But, in summer season, there is acute water scarcity causing unavailability

of green forage both of crop and wild plants. Due to which they have to depend on some dried fodder plant parts like husk, stems and leaves of some crop plants like, Jowar, Maize etc. Such type of fodder is only applicable for the animals like cow, buffalo, and bullock but cannot feed to animals like sheep and goats as they do not consume such dry form fodder. Cattles like cow and buffalo that are raised for the purpose of milk are highly affected in their milk production capacity due to unavailability of green fodder. So to feed animals like sheep, goats, cows, buffalos with green fodder, farmers needs to depend on the green leaves and branches of some wild plants. Author collected information of some such plants and studied and identified those plants scientifically and enumerated in this paper.

RESULT AND DISCUSSION

Total 29 plants belonging to different 17 families were recorded which are used as wild source of fodder for domestic animals. All plants are arranged alphabetically in the Table 1. with their, Botanical name, Local name and Mode of use.

Table.1

Sr. No.	Name of the plant & family	Local Name	Mode of use as fodder
1	*Acacia nilotica* (L.) Del. **Mimosaceae**	Babhul.	Leaves, fresh and dried pods of the plant are very nutritious used to feed goats and sheeps.
2	*Acacia chundra* (Roxb. Ex Rottl.) Willid. **Mimosaceae**	Khair	Leaves, fresh and dried pods of the plant are very nutritious used to feed goats and sheep's.
3	*Acacia leucophloea* (Roxb.) Willid **Mimosaceae**	Hiwar	Leaves are small and feeded to goats only.
4	*Albizia lebbeck* (L.) Willd. **Mimosaceae**	Shirish.	Leaves are eaten by all types of domestic animals when there is acute fodder scarcity.
5	*Balanites aegyptiaca* (L.) Del **Balanitaceae**	Hinganbet	Usually goats eat the leaves
6	*Bauhinia racemosa* Lamk **Caesalpiniaeae**	Apta	Goats and sheeps are provided with the branches of the shrub having leaves.
7	*Chenopodium album* Linn **Chenopodiaceae**	Jangli Palak.	This is eaten up by all types of domestic animals while free grazing.
8	*Coccinia grandis* (L.)Voigt **Cucurbitaceae**	Tondali	This type of climber is feeded to all types of animals.
9	*Cocculus hirsutus* (Linn) Diels **Menispermiaceae**	Vasanvel	This is the climber bears leaves in all seasons and feeded to domestic animals in acute drought conditions.
10	*Coix lacryma-jobi* Linn **Poaceae**	Ranjondhla	This is feeded to cows, buffalos and bullock.
11	*Cordia dichotoma* Forst. F **Ehretiaceae**	Bhokar	Big sized leaves are eaten up by goats in summer season.
12	*Cucumis callosus* (Rotl.) Cog **Cucurbitaceae**	Takamaki.	It is feeded to big cattles with other type of grasses.

13	*Euphorbia hirta* L. **Euphorbiaceae**	Dudhani	This is collected as a weed from the cultivated fields and feed to all types of domestic animals.
14	*Euphorbia hypercifolia* L **Euphorbiaceae**	-	This is collected as a weed from the cultivated fields and feed to all types of domestic animals.
15	*Ficus benghalensis* L **Moraceae**	Wad	Leaves are consumed by goats and sheeps when no other type of fodder available.
16	*Ficus glomerata* Roxb **Moraceae**	Umbar	Leaves of the tree are most nutritious and consumed by goats and sheep's very likely.
17	*Ficus religiosa* Linn **Moraceae**	Pimpal	Leaves of the plant are most popularly feeded to all types of domestic animals.
18	*Flacourtia indica* (Burm. F.) **Flacourtiaceae**	Hekal	Wild plant leaves are feeded to goats.
19	*Grewia tilifolia vahl* **Tiliaceae**	Dhaman	Leaves are provided to all types of animals in hilly regions.
20	*Helicteres isora* Linn **Sterculiaceae**	Murad Sheng	Rarely the leaves are feeded to goats.
21	*Leucaena latisiliqua (L.)Guil* **Mimosaceae**	Subabhul	This is cultivated and wildly grown species bears many compound leaves in all seasons and feeded to all types of domestic animals.
22	*Melia azedarach* Linn. **Meliaceae**	Bakan Neem	This is post popularly provided to goats.
23	*Morus alba* Linn **Moraceae**	Tuti	Leaves used for sericulture business are also sometimes provided to all types of domestic animals
24	*Prosopis cineraria* (L.) Druc **Mimosaceae**	Soundad	Sacred plant bears compound leaves popularly used to feed goats.
25	*Santalum album* L. **Santalaceae**	Chandan	Sacred tree bears abundant quanitity of leaves almost in all seasons. These are provided to all types of domestic animals especially in summer.
26	*Sesbania sesban (L.)Merr.* **Papillionaceae**	Shevari	Plants are grown wildly of sometimes cultivated. Leaves are used as fodder for all types of domestic animals.
27	*Tamarindus indica* Linn. **Caesalpiniaceae**	Chinch	This is eaten by goats and rarely by other types of animals.
28	*Tinospora cordifolia* (Willd.) Mier.ex Kook.F & Thom. **Menispermiaceae**	Gulvel	Most popular twinner produces many heart shaped leaves used to feed domestic animals in all seasons. It is having some medicinal properties too.
29	*Ziziphus mauritiana* Lamk. **Rhamnaceae**	Bor.	Most popular wild and easily available feed only can be eaten by goats.

All 29 plants belonging to different 17 families are utilized as an alternative source of fodder in different districts of Marathwada, when there is an acute scarcity of conventional fodder resources. Likewise many papers are published by scientists from different parts of world regarding use of wild plants as a source of fodder. Stevan et.al (2014), in his research article provided a list of such 10 wild

plants used in Africa. *Acacia angustissima, Calliandra calothyrsus, Gliricidia sepium, Leucaena trichandra, Morus alba, Sesbania sesban* are some of them used there as a source of fodder. It is evident that, these plants are very effective in increased milk and meat production, reduced vulnerability to drought, improved growth and health and reproduction, reduced soil erosion and in other respects. Above plants are grown in Africa by farmers in their fields. Rashid and Sharma (2012), in his manuscript, enumerated total 68 plants which are used as fodder source in Rajouri district of Jammu and Kashmir. As this region have large population of livestock, many plants like*, Albizia lebbeck, Ficus benghalensis*, *Ficus religiosa* Linn., *Ficus rumphii, Grewia optiva*, *Holarrhena antidysenterica, Kydia calycina Lannea coromondelica, Leucaena leuciceohala*, *Melia azedarach* etc are used as source of fodder. According to Makkar (2017), Cactus, *Opuntia ficus-indica* is proved a very nutritious source of fodder for domestic animals. Cladodes of the plant are are the rich source of Sugar, Ash and Vitamin A and C proved very nutritious for animals. The plant grows in the water scare areas, so it is boon for raising domestic animals in drought prone regions. Jamala et. al. (2013), studied 30 fodder trees and shrubs with their scope in the agroforestry. They enumerated 30 plants belonging different families which are proved as nutritious fodder for different domestic animals.

In the present investigation, Author tried to enumerate some wild plants commonly used as a source of fodder for livestock in Marathwada region of Maharashtra. It is clear from the data and some research papers that, the plants belonging to family Mimosaceae, Moraceae and Cucurbitaceae families are highly used as a source of fodder. Rest of the families contain their only few representative plants which are used as a source of fodder.

In the recent years, due to uncontrolled tree cutting practices, Marathwada region receives very low rainfall, so drought conditions. The wild plants which are proved as an alternate source of fodder are also getting cut in large number. So, farmers of the area should look after the matter avoiding tree cuttings. So, a permanent and all season source of fodder can be saved.

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नासिरा शर्मा का कथा साहित्य

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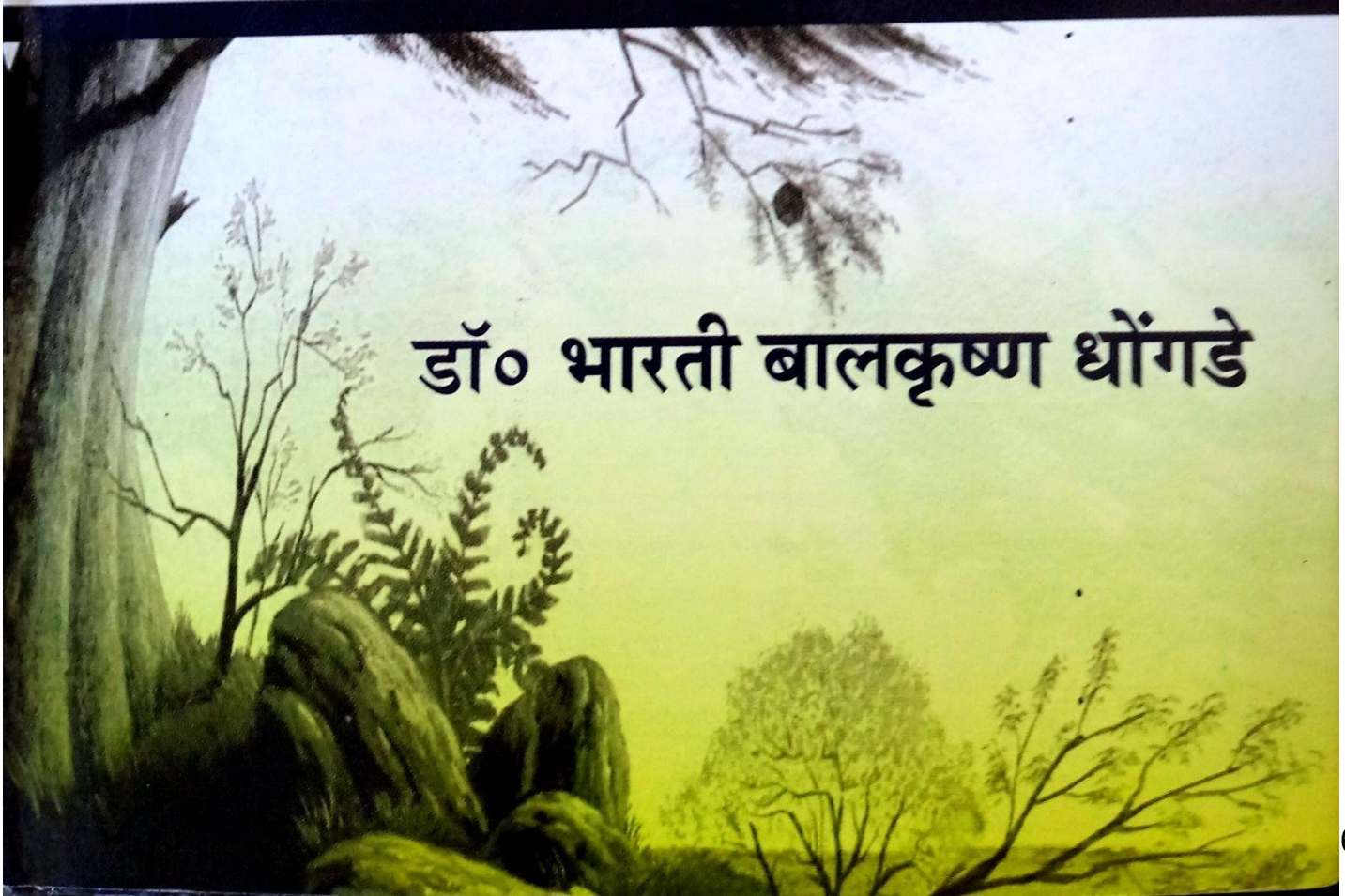

डॉ० भारती बालकृष्ण धोंगडे

नासिरा शर्मा का कथा साहित्य संवेदना और शिल्प

डॉ० भारती बालकृष्ण धोंगडे

चिन्तन प्रकाशन
हंसपुरम् , कानपुर-208 021

ISBN : 978-93-85804-26-7

पुस्तक	:	नासिरा शर्मा का कथा साहित्य : संवेदना और शिल्प
लेखक	:	डॉ० भारती बालकृष्ण धोंगडे
प्रकाशक	:	**चिन्तन प्रकाशन** 3ए/119, आवास विकास, हंसपुरम्, कानपुर – 208 021 chintanprakashan@gmail.com 0512-2626 265, +91 9450 151 379 www.chintanprakashan.com
संस्करण	:	प्रथम, 2018
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मूल्य	:	₹ 400.00
शब्द-सज्जा	:	रुद्र ग्राफिक्स, कानपुर
मुद्रक	:	पूजा प्रिन्टर्स, कानपुर

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शुभाशंसा

नासिरा शर्मा एक सक्षम स्त्री लेखिका हैं। उनका कथा साहित्य समस्त विश्व की स्त्रियों का बहुआयामी चित्रण का दस्तावेज है। स्त्रियों के जीवन का वास्तविक और यथार्थ चित्र प्रस्तुत करने में नासिरा शर्मा को पर्याप्त सफलता प्राप्त हुई है। परिवेश इनकी कहानियों का केंद्र-बिंदु है। वह अपने पूरे सामर्थ्य और संवेदना के साथ कहानियों में आविर्भूत हुई है। एक जीवंत पात्र की तरह उनकी उपस्थिति कहानियों में प्राणवान और अर्थवान बनाती है।

नासिरा शर्मा की कहानियों में लगभग बारह देशों की समस्त विशेषताएँ एक साथ उजागर हुई हैं। विभिन्न देशों की स्त्रियों का सूक्ष्म चित्रण उनकी संवेदनाओं के साथ चित्रित करना यह उनकी खूबी कही जा सकती है। नासिरा शर्मा की संपूर्ण संवेदना स्त्री जीवन से सराबोर है। वह चेतना इस जीवन में इतनी घुलमिल गई है कि वह उनका अविभाज्य अंग बनकर रह गई है। नासिरा शर्मा ने स्त्री-जीवन के देश-विदेश की तस्वीरों को खींचते-खींचते समाज की मानसिकता को भी आलोकित किया है, स्त्रियों की सूक्ष्म संवेदनाओं का अंकन, पृष्ठभूमि की सहजता सादगी को मूर्त करने में प्राय: व्यतिरेकी रूप में उपस्थित है। प्रा. डॉ. भारती बालकृष्ण धोंगडे एक परिश्रमी प्राध्यापिका हैं। उन्होंने एक स्त्री होने के नाते स्त्री-समस्या को देखा-भोगा है। अत: आलोच्य रचनाकार की कहानियों में स्त्री परिवेश का आलोचनात्मक विश्लेषण करने में उन्हें काफी सफलता प्राप्त हुई है। लेखिका का यह पी-एच.डी. का शोध-प्रबंध पुस्तकाकार ग्रहण कर रहा है, यह प्रसन्नता की बात है। प्रा. भारती धोंगडे का यह प्रयास स्तुत्य है। हिंदी रचना संसार में प्रा. भारती धोंगडे का यह अवदान पाठकों, आलोचकों को आस्वादित और प्रेरित करेगा, इसमें मुझे कोई संदेह नहीं है।

मैं प्रा. भारती धोंगडे से भविष्य में निरन्तर साहित्यरत, रहकर नवीन रचनाओं की आशा करता हूँ। उनके उज्ज्वल भविष्य के लिए अनेक शुभ कामनाएँ।

-प्राचार्य डॉ० शहाबुद्दीन निवाज मुहम्मद शेख
लोकसेवा, आर्ट्स, विज्ञान महाविद्यालय
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अनुक्रम

6

नासिरा शर्मा की कहानियों में संवेदनाओं का मूल्यांकन

नासिरा जी की कहानियाँ केवल साधारण कहानियाँ नहीं हैं, बल्कि इन कहानियों के गर्भ में यथार्थ समाज की चुनौतियाँ, अंर्तगत विरोध, विसंगतिया, मानसिक अंतर्द्वन्द्व, टूटते हुये संबध दिखाई देते हैं।

नासिरा जी की कहानियों में वैयक्तिक, सामाजिक, राजनीतिक, मनोवैज्ञानिक अस्तित्ववादी संवेदनाओं को नीति की कसौटी पर कसने से कई ऐसे पात्र हैं जो नीतिहीन है या किसी परिस्थिति के शिकार हैं, तो कई पात्र आदर्शवादी हैं।

नितीहीन

नीतिहीन 'जहांनुमा' कहानी में सांस्कृतिक दिखाई नहीं देती। "पुरुष दूसरी स्त्री से विवाह बद्ध होकर भी खुश नहीं है, तो फिर से पहली स्त्री के पास आता है। वह स्त्री उसका धिक्कार करती है।"[1]

सामाजिक मूल्यों में परिवर्तन आया उसी के अनुरूप मानवीय मूल्यों का विघटन हुआ। नये मूल्यों के निर्माण की दिशा अग्रसर हुई। यद्यपि यह प्रक्रिया अभी पूर्ण नहीं हुई, तथापि पर्याप्त सीमा तक यह परिवर्तन देखा जा सकता है।

नीतिहीन 'घुटन' कहानी में "पड़ोस में लड़की की मौत होने पर भी सभी को अपने घर परिवार व्यक्तिगत कार्यों की जल्दी है। जो पड़ोसी परदेशी मेहरू के जीवित रहने पर अपने अपने स्वार्थों से उससे जुड़े थे।"[2]

उसे मात्र प्रतिक्रिया नहीं कहा जा सकता। उनके पीछे युगीन चेतना और आधुनिक संवेदना है। वस्तुत: पिछले कुछ वर्षों में व्यक्ति की यौन भावना परिवर्तित हुई है। हिन्दी कहानी ने इस परिवर्तन को ग्रहण किया है। यही कारण है कि उसके यौन वर्णन की दृष्टि और मानदण्ड परिवर्तित हो गये हैं।"[3]

आज से दो दशक पूर्व का रोमाण्टिक आदर्श अब उसमें शेष नहीं है। इसके अनेक कारण हैं, जिनके सूत्र दूसरे महायुद्ध से मिलने प्रारंभ होते हैं। इग्लैंड पर जर्मन बमबारी के भय स्वरूप लाखों लन्दनवासियों को भूमिगत रेलवे स्टेशनों

डॉ० भारती बालकृष्ण धोंगडे

जन्म- 6 अक्टुबर सन् 1973, ओझर (मिग) नासिक

शिक्षा- एम०ए०, बी०एड०, एम०फिल०, सेट, सावित्रीबाई फुले पुणे विश्वविद्यालय, पुणे (महा०), पी-एच०डी०, श्री जगदीश प्रसाद झाबरमल टीबड़ेवाला विश्वविद्यालय, झुन्झुनू (राज०)।

सम्प्रति- सहायक प्राध्यापिका, हिन्दी विभाग, मराठा विद्या प्रसारक समाज, नासिक, महाराष्ट्र।

प्रकाशन- विभिन्न पत्र-पत्रिकाओं में अनेक शोध लेख प्रकाशित।

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₹ 400.00

ISBN: 978-93-85804-26-7

ISBN: 978-81-929124-4-8

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Rhizosphere Mycoflora: An Over View

Dr. Vitthal B. Sonawane

The German agronomist and plant physiologist Hiltner 1904, first coined the term define of the rhizosphere to describe the plant root interface, a word originating in the part from the Greek word rhiza meaning root and sphere meaning field of influence. Hiltner describe the rhizosphere as the area around a plant root in the inhabited by a unique population of microorganisms influenced, he believed, by the chemicals released from the plant roots. The region of the soil around the roots in which the maximum microbial growth and the activities operate is called rhizosphere. Other simple define of rhizosphere - soil around the root of the plant where microbial activity is high it is called rhizosphere

The concept was discovered by Hiltner. Rhizosphere inhabiting microorganisms participate for nutrients water and space and sometimes improve their attraction by developing a close relationship with plant. The release of organic material provides the energetic force for the development of active microbial populations in a region that includes plant root and surrounds soil. This phenomenon is referred as the rhizosphere effect. This zone is about 1mm wide but has no distinct border. Comparatively, it is an area of intense biological and chemical activity influenced by compounds exuded by the root and by microorganisms feeding on the compounds.

As the plant roots growth through the soil they release water soluble compounds such as sugars organic acids and amino acids that supply food for the microorganisms The food supply means microbiological activity in the rhizosphere is much greater

than in soil away from the plant roots and in return the microorganisms provide nutrient for the plants.

The rhizosphere has been developed toconsist of three zones. The endorhizosphere includes portions of the cortex and endodermis in which microorganisms can inhabit the free space between cells. The rhizoplane is the medial zone directly neighbouring to the root including the root epidermis and mucilage. The outermost zone is the ectorhizosphere which extends from the rhizoplane out into the bulk soil. The rhizosphere is not a region of definable size or shape, but instead, consists of gradient in chemical, Biological and physical properties. Tapwal et al., (2003) studies by rhizosphere is a zone of increased microbial activity in the vicinity of plant roots. Increases in microbial community are due to the exudation of plant roots. On the other hand, the micro floras associated with root surface are called rhizoplane. High microbial density in the rhizosphere and rhizoplane is due to the presence of the organic compound exuded from the roots Microorganisms growing on plant root can influence plant growth.

The rhizosphere effects

The improvement of the growth of a soil microorganism resulting from physical and chemical modification of the soil and the involvement of excretions and organic waste of roots within a rhizosphere, when the seed germination and seedling growth, the development of the plant interacts with the microorganisms present in the surrounding soil. As seeds germination take place the roots growth occurs in the soil. The release of organic material provides the driving force for the development of active microbial populations in a zone that contain plant root and surrounding soil in a few mm of thickness. This phenomenon is referred as the rhizosphere effect by Morgan *et al.*, 2001. Mostly there are three distinct components recognized in the rhizosphere – the rhizosphere, the rhizoplane and the root itself.

The rhizosphere region is a highly favourable habitat for the proliferation, activity and metabolism of numerous microorganisms such as bacteria, fungi - rhizosphere effect is selective and significant on specific fungal genera e.g. *Penicillium, AspergillusFusarium* etc. which are stimulated, actinomycetes, protozoa and Algae

Rhizosphere effect on Soil organic matter has been long recognized as one of the most important components in maintaining soil quality, soil fertility and agricultural sustainability. The soil zone strongly influenced by plant roots, the rhizosphere, plays an important role in regulating soil organic matter decomposition and nutrient cycling. Theses process may include exudation of the soluble compounds, water uptake, nutrient mobilization by the roots and microorganism, rhizosphere mediated soil organic matter decomposition and the presently release of CO_2 through respiration. Rhizosphere processes are major gateways for nutrients and water theses process utilize approximately 50 % of the energy fixed by photosynthesis in terrestrial ecosystems and mediate almost all aspects of nutrient cycle. Plant root and their rhizosphere interactions are at the centre of many ecosystem processes.

Root exudation

The outer epidermal layer of living root hair and all plant roots are covered with mucilage and cuticle. Organic and inorganic compounds accumulated in cytoplasm of root cells are diffused out. This loss occurs probably due to the unfavourable conditions external to the root known as root exudation. Root exudation is the release of organic compound from living plant roots into the surrounding soil. The root exudates are affected by various environmental factors including ph, soil type, soil temperature, nutrient availability, oxygen status light intensify and the presence of microorganisms rates of exudation vary widely among species and environmental condition.

Healthy roots exude various organic compounds. Including more than 100,000 different types of low molecular weight Secondary metabolites called root exudates. Root exudates are carbonaceous substance containing a wide range of amino acids sugar organic acids water soluble and various vitamins and enzymes and other compounds. Sugars and amino acids in the roots exudates stimulate the germination of resting spores of fungi. Root exudates are transported across the cellular membrane and secreted in to the surrounding rhizosphere. Plant products are also released from roots border cells and root border like cells which separate from the border as they grow. The efficiency of the exudation process may thus be enhanced by stress factors affecting membraneintegrity such as temperature extremes nutrient deficiency.

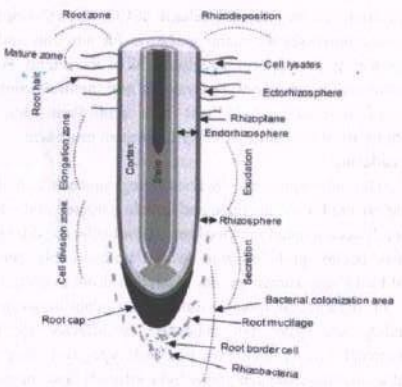

Fig.1: Different root zones in Rhizosphere.

Mycorrhizal fungi

Mycorrhiza is a general term describing a symbiotic relationship between a soil and fungus and plant root. Unlike rhizobia and their legume partners'mycorrhizal association are ubiquitous and relatively non selective occurring 80% of angiosperm and in all gymnosperm.

There are two types of mycorrhizal associations with plant roots ectomycorrhiza and endomycorrhiza, which are differentiated by how they physically interface with the plant.

a) **Ectomycorrhizae** occur mainly in the roots of woody plants and form a dense hyphal covering over the root tip from which hyphae grow into the intercellular spaces forming a net of hyphae around the root cortex cells, but do not penetrate the cell walls.

b) **Endomycorrhizae** fungal hyphae grow into the root cortex and enter the cells forming fan like highly branched structure known as an arbuscule that remain separated from the cytoplasm by the plant plasma membrane. The endomycorrhiza can be further divided into the more wide spread arbuscularmycorrhiza and the specialized orchid and ericoid mycorrhizas which, as the name implies, are colonizers or orchids and ericoid e.g. cranberry plant species. The arbusculesmycorrhiza association in both cases the Hartignet of hyphae and the arbuscules increase the contact area between the fungus and the plant through which the transfer of nutrients to the plant and carbon to the fungus occurs.

The endomycorrhiza are wholly dependent on the plant for their carbon and when associations occur, both endomycorrhiza and ectomycorrhiza can demand up to 20 to 40 % of the total photosynthetically fixed the carbon, plant produces. Amusingly, the dense, intertwined network of fungal hyphae forms a common mycorrhizal network, in which hyphae from mycorrhizae infecting two or more plants are interconnected.

Role of rhizospheric microbes

The rhizosphere microbes also play very important role in improving medicinal values of plants. The large variety of fungi and bacteria is recognized in the rhizosphere soil of medicinal plants that showed significant effect in secondary metabolite alteration and uptake of plant nutrient.

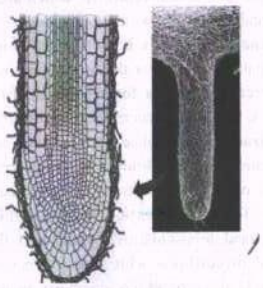

Fig.2: Ectomycorhiae

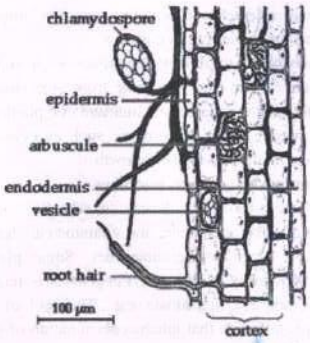

Fig. 3: Endomychorhizae

Rhizospheric microbes affect the plant physiology by imparting several useful effects such as nitrogen fixation, nutrient uptake, and production of secondary metabolites in the medicinal and aromatic plants. Many rhizospheric fungi are associated with plant root in the form of mycorrhiza. Mycorrhizal fungi promote plant growth by various ways. Rhozospsheric microbes induce development of lateral root, root hairs development and mucilage secretion from plant root. Microorganism also increasesthe rate of exudates secretion. Exudates secretion from the plant root helps in formation of soil aggregative that improve soil fertility. Rhizospheric microbes induce development of lateral root, root hairs. Development and mucilage secretion from plant root

Rhizospheric microorganisms are important for plant growth. They promote plant growth. Some rhizospheric bacterial

such as R*hizobium,Azotobacter*, *Clostridium* etc. Fix atmospheric nitrogen and make it available for plant growth.

Many phosphate solubilising microbes such as bacillus found in rhizosphere release free phosphate from inorganic salt of phosphate. Free phosphate is important nutrient for plant growth. Several microbes produce growth hormone such as Gibberellins, Indole acetic acid etc that promote plant growth

Effect of plant root on rhizospheric microbes

The Plant root produces exudates containing carbohydrate, amino acids, nucleotide, and vitamins etc. that serves as food for growth of rhizosphericmicrobes. Some plant root produce chemical that bring fungistasis. Fungistasis is referred to the incapability of spore to germinate e.g.. The root of Allium produces alkylcystin sulfoxide that inhabits germination of sclerotic (spore) of *scelrotium capivarum*. Some plant root produces antimicrobial chemicals such as glycosides and antifungal agents that inhibit growth of rhizospheric microorganisms.They promote plant growth by carrying out various biogeochemical transformations in soil and hence increase amount of plant nutrient in soil. They also produce plant growth hormone and protect plant against from pathogens.

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ISBN: 978-81-929124-4-8

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Biological Science

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attacking herbivore, the cost to the plant in putting up its defenses and to the fungus in transporting the message is high and unnecessary. So, in an environment where there are many different plant species, species-specific signals may be selected for over time; in areas where there are few plant species, a generic signal would suffice.

As research continues, the mysteries of "defense-related" interplant communication via CMN's will be revealed. Field studies are particularly important because they can paint a more accurate picture compared to "highly simplified laboratory conditions." One exciting thing about this type of communication is that it may mean that some plants are communicating with each other across great distances, since "some species of fungi can be vast." CMNs can also target specific plants, and compared to communication via aerial VOC's, the signal will not be diluted by the wind.

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Mycoremediation: An Effective Tool to Decontaminate Environment: A Review

Dr. Bhagwat Chavare

Fungi are the most diverse group of living organisms having a wide adaptability in variety of environmental conditions. Fungus successfully made a way in the life of human being through its wide range of applications in food processing, drug production, enzyme technology and many more fields. They are widely being used in each and every aspect of human life and having a huge role fulfilling needs of growing population. In the present article an attempt is made to discuss one more novel application of fungi, Mycoremediation. It is evident from the literature screening that, they plays very important role in the biodiversity and productivity of plants which is ultimately leads to regulation of different food chains in nature. A variety of fungal species has a capability to degrade different types of pollutants from environment by using their metabolic products like lignin degrading enzymes. In the present situation ever polluting environment can be decontaminated by using fungus which is a cost effective and eco-friendly way.

Fungi are ubiquitous, achlorophyllus, spore-bearing eukaryotes composed of chitin containing cell wall. Over 120,000 species were identified till today. Fungi are considered as one of the most adaptable groups of organisms and also as an essential component of soil because they decompose organic matters and provide nutrients to plants. Apart from this, they are plays important role for the production of various environmental products such as antibiotics, drugs, pigment production, food industry and bioremediation. In the present article, the special application of various fungi is discussed. Author gone through

many articles based on fungal bioremediation and an effort is taken to gather information about use of various fungi to decontaminate soil.

Different types of Metals are present in the soil in different forms including free metal ions, oxalates, carbonates and hydroxides. The degree of their toxicity on living organisms is based on their relative availability. Their availability is depends on pH, organic matter and clay content of the soil. Soil micro fungi are able to tolerate concentration of various metals and restrict entry of metals into the cells by extracellular metal sequestration.

Population explosion and rapid development in the developing countries resulted in the loading of large quantum of contaminants and recalcitrant compounds like Polyaromatic hydrocarbons (PAHs), Polychlorinated biphenyls (PCBs), Polychlorinated dibenzp-dioxins (PCDDs) and heavy metals in the environment. To treat such contaminated environment some physicochemical methods can be effectively used but are not feasible in large scale. Bioremediation is one of the important, efficient and feasible solutions to treat and remove pollutants from the environment and soil.Fungi act as decomposer and symbionts in all ecosystems including soil due to their robust morphology and diverse metabolic capacity. So, Mycoremediation is a form of bioremediation in which fungus are well suited for the purpose of treatment of contaminated soils.

Xenobiotic compounds are produced in high amount annually and remains persistent in the environment. Wastewater, landfill leachates and solid wastes are the main sources of xenobiotic compounds. Different types of xenobiotic compounds are phenols, plastics, hydrocarbons, paints, dyes, pesticides, insecticides, paper and pulp mill wastes pharmaceutical remains etc. Xenobiotic compounds can show some carcinogenic and mutanogenic effects. The treatment on such compounds can be done by using different biological processes which is also referred as bioremediation.

Different Types of fungal species reported for various types of waste bioremediation

Shivanand *et al.* (2019) carried out an excellent study on fungal isolation and its applications in possible bioremediation. They isolated fungi from different sources including forest, coastal, mycorrhizal, and endophytic ecosystems. It is clear that, different types of habitats contain diverse fungal species. It is evident from the study that, forest ecosystem contains common fungal species like, *Aspergillus, Penicillium, Trichoderma and fusarium, Penicillium, Cladosporium* etc. The fungal species commonly observed from coastal areas are *Scutellospora, Glomus, Gigaspora, Sclerocystis*etc and from freshwater river contains species like *Aspergillus, Penicillium, Thielavia, Fusarium*, etc.Many mycorrhizal fungi also isolated from different higher plants including orchids. Endophytic fungal strains like *Alternaria, Fusarium, Pestalotiopsis* are also found grownabundantly in the tissues of different higher plants. It is reported that, different species of fungi are highly beneficial for degradation of pollutants including oil spills and different types of alkanes. Coastal fungal species including, *Alternaria alternate, Aspergillus flavus, A. niger, Penicillium chrysogenum, Trichoderma harzianum* are most common species involved in it. Anthracene is completely degraded by*Penicillium oxalicum.*

Fusarium oxysporium shows major bioremediation efficiency. Sashirekha and Usmani (2016) with their research proved it. Fungus can tolerate the pH range from 5 to 11 means it can adapt itself to acidic and basic pH conditions. It has metal tolerance index for zinc 3.7 % to 51 % ppm and 1% to 53% for lead (Sashirekha and Asra, 2016). *Scedosporiuma piospermum, Penicillium spp*and *Aspergillus spp.* have proved experimentally to be effective to degrade polychlorinated biphenyl (PCB) present in historically contaminated soil (Varese *et. al.*, 2009).

The diversity of habitat and ability for secreting multitude of enzymes makes fungi potential candidates for bioremediation.

White rust fungi like *Phanerochaetechy sosporium, Tramtes versicolor, Bjerkandera adjusta* and *Pleurotus sp.* can produce various lignolytic enzymes can be used for the bioremediation of pharmaceutical and personal care products which can result in effects such as bioaccumulation, acute and chronic toxicity. The lignolytic enzymes from white rust fungi have been applied for transformation of organic pollutants such as pesticides using biopurification system. Some species of white rust fungi such as *Coriolus versicolr, Hirschioporus larincinus, Inonotus hispidus* etc. are used for decolourization of dye effluents. Many species of white rust fungi have been reported to be used in reduction of total phenolics, cresolate, petroleum hydrocarbons and high molecular weight PAH fractions. Marine fungus, *Trichoderma harzianum*has, the capacity to transform pentachlorophenol whereas the *Mucor, Aspergillus* and *Penicillium* show bioremediation potential for water soluble crude oil fractions (Deshmukh *et.al.* 2016). Different types of enzymes secreted by white rust fungi are also causes degradation of different types of xenobiotic compounds present in the soil and environment. Such enzymes include lignin peroxidase, manganese peroxidase, oxidase, laccases etc. (Mariem and Sayadi, 2016).

Young (2012) reported that, extracellular enzymes secreted by white rot fungi during lignin decay can be used as promising agent for oxidizing pollutants. He used *Punctularias trigosozonata, Irpexlacteus, Trichaptum biforme, Phlebia radiate, Trametes versicolor* and *Pleurotus ostreatus* species of white rot fungi. All species tested have degraded C 10 alkane, C 14 alkane and polycyclic aromatic hydrocarbon phenanthrene. Bioremediation and detoxification of wastewater originated from textile industry have been practiced by using white- rot fungus to make water reusable (Hossain *et.al.* 2016). The decolonization capacity of white rot fungus *Coriolus versicolor* was confirmed by them through agar plate and liquid batch studies. *Phanerochaete chrysosporim, Pleurotusostreatus, Trametes versicolor,*

Bjerkandera adusta, Lentinula edodes, Irpexlacteus, Agaricus bisporus, Pleurotus tuberregium and *Pleurotus pulmonarius* are some mushroom white rot fungi used for the purpose of bioremediation and to degrade different xenobiotic compounds (Christopher, 2014).

Fungal laccases are blue multicopper oxidases which catalysze the monoclectric oxidation of a broad spectrum of substrates like polyphenols, aromatic and aliphatic amines etc. can be used as a tool for bioremediation. Laccase fro white rot fungus *Trametes hirsute* is used to oxidize alkanes. Laccase from *Flavodon flavus* is useful in decolourization of several synthetic dyes, (Viswanath *et.al.* 2014). Fungal laccases are applicable in variety of fields like paper and pulp industry, textile industry, xenobiotic degradation and bioremediation.

Ligninolytic fungi are highly useful in the bioremediation of contaminated soils. The most important role of ligninolytic fungi in nature is to regulate global carbon cycle. Naturally the ligninolytic fungi produce some extracellular enzymes which degrade wood material, plant litter as well as soil humic substances. Same enzyme can be utilized to degrade other recalcitrant organic compounds such as toxic metals. By using lignolytic fungi, it could be possible to widen the applicability of bioremediation even to persistent Organic Pollutants (POP), PAHs, and PCDD rich soils.

Seguel *et. al.* (2017), concluded by their research that, arbuscular mycorrhizal fungi such as *Claroideoglomus claroideum* along with *Oenothera picensis* plant contributes to phytostabilize the copper in the contaminated soils. Autochthonous filamentous fungi are highly useful in bioremediation of a soil historically contaminated with aromatic hydrocarbons. Petruccioli *et. al.* (2006) isolated nine fugal strains from an aged and heavily contaminated soil to study their degradative potential. It was observed that the strains like *Allescheriella sp., Stachyobotrys sp. and Phlebia sp.* fungi led to a significant decrease in soil toxicity

by removing different types of aromatic hydrocarbons including naphthalene, dichloroaniline,o-hydroxybiphenyl and 1,1-binaphthalene.

Apart from above different types of contaminants, fungi can be used to repair the sites contaminated by acidic radioactive wastes. The radioactive wastes are highly acidic and mixed with heavy metals are continuously leaking in the environment causing contamination of soil as well as groundwater. It is not possible to cleanup such radioactive sites by physicochemical processes due to danger and high expenses. So, some radiation resistant bacterial strains like *Deinococcus radiodurans* can be used to treat such soils but have some limitations. They are very sensitive to low pH and can't survive. So, finally some strains of yeast are reported for bioremediation which are resistant to ionizing radiation. *Rhodotorulatai wanensis* is most specialized fungus applicable for the treatment such a polluted site. Filamentous fungal biomass has a great potential to produce large amount of biomass on the contaminated water with different types of metals with which these are able to absorb metals like Pb, Zn,Cd,Cu, Cr, As and Ni. Many fungal species have been reported such as *Trichoderma autroviride, T. harzianum, T. virens* and *Aspergillus niger*, that are used for bioremediation of polluted areas. Other fungal species including *Penicillium, Rhizopus, Mucor, Saccaromyces* and *Fusarium* have also shown the capacity to biosorb different types of metals present in the waste water. Polycyclic hydrocarbons (PAHs) are widespread pollutants raising public health concerns because of their chronic toxicity and environmental problems due to their persistence and accumulation in the ecosystem. The filamentous soil fungi like *Talaromyces helices* have shown the capacity to degrade organic pollutants including PAH. Fungus will have some major limitations while bioremediation such as high chemical stability and low bioavailability of PAHs. This limitation has been overcome by Baranger *et. al.* (2018) by the microfluidic approach in which benzo [a] Pyrene (BaP) are used to mimic

polluted soil microenvironment. Sharma and Malvia (2014), reported the bioremediation of tannery wastewater by Chromium (Cr) resistant fungal isolate *Fusarium chlamydosporium*.

Akwaji *et. al.* (2016), reported that, *Penicillium* sp. can biodegrade the hydrocarbons present in spent engine oil. Soil is added with different concentrations of spent engine oil inoculated with *Penicillium* sp. In that soil they seeds of *Telfeira occidentalis* plant was sown and assessed for growth performance. It was observed that, after 28 days of plant growth, the added spent engine oil was no longer detected. The plant began producing pods because *Penicillium sp.* could degrade hydrocarbons of spent oil completely. Teresa (2011) reported that, petroleum substances are the main source of pollutants stored in old waste pits which are responsible for degradation of biological life in the area of storage. The non pathogenic bacteria and fungal species can be used for the biodegradation of such petroleum hydrocarbons. *Aspergillus sydowii, Cladosporium cladosporioides* and *Phanerochaete chrysosporium* are some fungal species used for the purpose. *Aspergillus ustus* and *Alternaria alternate* have been tested against diesel fuel by Kaled *et. al.* (2015). According to their study, the two fungal strains can degrade 92-100% diesel after 7 days. The degradation process was enhanced using fungal consortium of both the strains.

Due to resistance to biological process, plastic waste in the environment is a significant threat. Brunner *et. al.* (2018) reported the ability of some fungal strains found on floating plastic debris to degrade plastic. The fungal strains are collected and identified genetically and used to test their ability to degrade polyethylene and polyurethane. Results of the tests have shown that, none of the strain was able to degrade polyethylene however four strains were able to degrade polyurethane. Out of four strains three were litter saprophytic which includes *Cladosporium cladosporioides, Xepiculopsis graminea,* and *Penicillium griseofulvum*. One strain that is, *Leptosphaeria sp.* was the plant

pathogen. The fungus strains collected from other than plastic source also shows the ability to degrade the plastic. *Agaricus bisporus, Marasmius oreades* and *Pestalotiopsis microspora* are such fungal species.

Podosporaan serina is a special type of fungus which reproduces only by sexual means, non-pathogenic, cosmopolitan species is used for the bioremediation of soils which are contaminated with aromatic amines (Philippe *et.al.* 2011). Fungus has its arylamine N-acetyltransferase 2 enzyme which has ability to detoxify the highly toxic pesticide residues 3,4-dichloroaniline present in the soil. 3, 4 dichloroaniline belongs to the class of aromatic amines.

Use of pesticides and herbicides is an effective method to control different types of pests including weeds. Bout overuse of those can cause harms to environment. The increased concentration of pesticides and herbicides in the soil can be controlled by using bioremediation. Gokhan (2017) carried out a research on the application of some selected fungi on bioremediation of herbicide Chlorsulfuron. According to his study, the fungal species such as *Penicillium thrichoderma, Penicillium simplicissimum, Penicillium talaromyces, Metacordyceps chlamydosporia, Stachybotrys chartarum* and *Alternaria alternata* are effectively involved in the degradation of the herbicide Chlorsulfuron.

Soil and water are the very important components required for the plant growth. Agriculture production is highly affected by quality and quantity of soil and water. Due to industrialization, urbanization, mining, overuse of fossil fuels and modern agriculture different types of contaminants like toxic metals, hydrocarbons, pesticides, herbicides, aromatic amines, plastics, radioactive wastes and many other types of life threatening waste are mixed and continuously being released in soil and water. The treatment of such harmful wastes by using physicochemical methods has some limitations and may gives rise

to secondary pollutants in the environment. Bioremediation is an effective and efficient way to minimize such type of contaminants in the soil. Fungi are cosmopolitan in nature and can grow at acute adverse conditions where other microorganisms cannot grow. Many white rot, filamentous, lignolytic, arbuscular mycorrhizal and other fungal species can be effectively used to reduce concentration of variety of life threatening contaminants saturated in variety of soils and water resources. This approach is very useful to make contaminated soil usable for crop production. Thousands of acres of land contaminated by variety of pollutants may be converted in to fertile land leads to increase agricultural production and important to meets needs of growing population. Water is another necessary component required for living organisms and crop production. Due to various manmade calamities, natural water resources are getting contaminated by different types of wastes. Polluted and contaminated water can be purified by minimizing the concentration of different types of pollutants dissolved and suspended in it. This can be achieved by using different types of fungal species especially, filamentous fungi.

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Biological Science is the study of life and living organisms, their life cycles, adaptations, interactions and environment. Biological Science broadly can be differentiated into basic and modern biological science, both are of equal importance. It is a natural science, which includes physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution. This is an attempt to provide a platform to persons who are working in the field of teaching and research in Biological Science. This book covered the extensive literature on **Current Views on Biological Science** and provided its value to generation of students, researchers ans Professors as an authoritative thought-provoking and readable reference to the field of Biological Science.

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12, Janak Pride, Sadashiv Nagar, (Govind Nagar),
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ISBN 978-81-9291
9 788192 912448

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urrently, our planet is dealing with a slew of environmental issues. Global warming, acid rain, pollution, urban sprawl, waste disposal, ozone layer depletion, water pollution, climate ange, and other environmental issues touch every people, animal, and nation on the earth. ıe exploitation of our globe and the destruction of our ecosystem have been increasing at an ırming rate since last many decades. Natural disasters such as flash floods, earthquakes, izzards, tsunamis, and cyclones have become increasingly common as a result of human acts at are not in favor of protecting this planet. A labyrinth of subversive environmental problems surfacing all across the globe. This book is presciently engaged in unearthing the ovenances of the multifarious environmental issues of recent times and intending to find out e solution for the same.

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18.

Ecosystem Management and Conservation

Dr. V. B Sonawane*

Introduction

According to 1992 UN Earth Summit, biological diversity is the variability among living organisms from all sources including terrestrial, inter alia, marine and other aquatic ecosystem and ecological complexes. Environmental science is a multidisciplinary subject that deals with the systematic study of every environmental issue which effects the living organisms and human beings on the surface of the earth. Environmental science is a collective study of many subjects and its components include Biology, Physics, Chemistry, Geography, Sociology, Anthropology, Economics, Statistics, Ecology, Engineering and Philosophy. Environmental knowledge is plays an importance role in our daily

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life. It helps in solving the various problems which are arising in the environment rapidly and without any checks. The government is trying their level best to bring environmental awareness in common media.

Environmental difficulties represent some of the most complex and pressing contemporary social issues. Beyond physical changes to the environment, threats such as those posed by global climate change present difficult challenges, from public health hazards to threats to societal and political institutes, community infrastructure (Doherty & Clayton, 2011; Intergovernmental Panel on Climate Change, Swim, Clayton, & Howard, 2011). These destabilizing features can have both social causes and social consequences. For instance, carbon dioxide is currently being produced by the collective consumption of fossil fuels at approximately twice the rate at which it is being removed from the atmosphere by natural processes. As a result, the current period is the warmest on record in the history of modern civilization, with impacts that disproportionately affect poorer nations (Wuebbles et al., 2017). Goals should be set as a result of negotiation between all stakeholders, and indicators should be chosen carefully to match the goals. Adaptive management is the key to dealing with the highly complex, uncertain and unpredictable nature of socio-ecological systems (Williams et al 2011). Typical steps in setting up a sustainable ecosystem management system (Tallis et al., 2010). Ecosystem means the Convention on Biological Diversity means a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit (UNEP 1992). Ecosystem conservation involves protection and regulated utilization of the ecosystem.

Environmental management is defined as the management of the interaction and effect of human actions on the natural environment through the identification and management of factors that have a stake in the competitions that may rise between meeting social and financial needs but protecting the environment. Environmental conservation is the protection, renovation of natural environments. The main idea of ecosystem management is to maintain long term sustainability for the manufacture and ecosystem services.

Ecosystem Management is a Process that Aims and Objective

1. Ecosystem management is a process that aims to conserve major ecological services and restore natural resources while meeting the socio-economic, political and cultural and needs of current and future generations.
2. The main objective of ecosystem management is the efficient maintenance and ethical use of natural resources. It is a multifaceted and holistic approach that requires a significant change in how the natural and human environments are identified.
3. Many people and organizations have defined ecosystem management. The following examples represent a cross-section of definitions.
4. The ecosystem was first defined by A. Tansley in 1935. As per Tansley, the ecosystem has two major components and there is the interaction between and within the components.

❖ "A strategy or plan to manage ecosystems for all associated organisms, as opposed to a strategy or plan for managing individual species "(Forest Ecosystem Management Assessment Team,

1993)

- "A resource management system designed to maintain or enhance ecosystem health and productivity while producing essential commodities and other values to meet human needs and desires within the limits of socially, biologically and economically acceptable risk" (American Forest Paper Association Forest Resources Board, 1993)
- "Integrating scientific knowledge of ecological relationships within a complex socio-political and values framework toward the general goal of protecting native ecosystem integrity over the long term" (Grumbine, 1994)

5. Environmental conservation refers to the protection of the environment from being destructed through practicing various ways of environment protection such as destocking, afforestation, recycling wastes and planting of cover plants. It is the responsibility of everyone to ensure that our environment is conserved since a better environment is good for all of us.

Scope

1. The growing awareness that ecosystem services are closely linked to human health and well-being has focused attention on devising new ways to understand and manage humankind's relationship with the natural world, in the interest of respecting and sustaining biodiversity and functioning ecosystem.
2. To identify the environmental problem and to find its solution. To limit and regulate the exploitation and utilization of natural resources.
3. Ecosystems provide important supporting,

provisioning, regulating and cultural services, such as carbon sequestration, climate regulation, food, fresh water production, flood regulation etc.

4. To control environmental pollution and gradation.
5. It further means ensuring that species within ecosystems the unbelievable variety of microbes, plants and animals can fulfil their biological natures and functional roles as symbiotic members of ecosystems in support of human and non-human life.

Effective of Environmental Conserved

1. Reducing the harmful effects of hazardous and dangerous materials
2. To promote economic policy.
3. Building up suitable capacity to prevent environmental pollution
4. Reducing the amounts of waste produced.
5. Preparing to affect the setting of targets for the next phase of the implementation of the United nation Climate Protocol, and then carrying out the necessary measures.

Methods of Conservation

1. **Soil Conservation-** The conservation of soil for environmental conservation, essential for conservation of soil has to attract the harmful effect of soil pollution. Soil is the important element, role in soil erosion, land degradation and floods. Soil is filled with rich nutrients for plant production. Soil conservation can be carried out by ensuring smallest use of composts and toxic elements as well as eradicating the disposal of harmful industrial waste in the soil.
2. **Managing Waste** – We can select for various

technique like Reuse, Recycle, dry and wet waste isolation among others. Solid waste is produced by market area, homes, settlement area, industries and many other locations. We should manage our solid waste and help keep the environment healthy. The Municipalities should also conduct programs that manage solid wastes. Moreover, we should teach ourselves how to manage our waste without scattering all over.

3. **Forest Conservation-** Tree planting, Afforestation and reforestation help in conserve environment. The forests which are responsible for tapping absorbing a enormous amount of carbon dioxide from reaching the atmosphere. We know that plants are the most essential sources of food air as well as day to day products use. We should make it our life mission to plant trees as much as possible. Additionally, regulation that protects the forests should be highlighted.
4. **Reducing our Water Consumption-** clean water is valuable and not easily available. Prevent water pollution otherwise, Reduce the number of baths, turn off the taps, use take showers, washing machine, do not discard waste in bodies of fresh water and recycle it. We should conserve clean and fresh water. Avoid to disposal of harmful waste chemical elements waste in the water bodies.
5. **Control Pollution-** We need to adopt environmentally sustainable methos to minimise multiple types of emissions. Pollution control is a term used environmental management. Avoid herbicides, pesticides, insecticides, chemical fertilizers etc. that pollute the environment. We should maintain our cars it is possible as they are primary source of control of air pollution. We should

control air pollution it is possible, to conserve the environment

6. **Public Awareness-** A Public awareness and education project most of important strategies for preventing crime. Environmental protection with your friends and family members, Counting on local Television and radio stations on a major local daily newspaper. So that everyone is made aware of conservation of environment.

Encourage Environmental Conservation

1. **Education-** Environmental conservation requirements to be bigger part of the education system. We should teach our young ones how to conserver of the environment as well as the consequences of not doing so.
2. **Ban Plastics:** Plastics are responsible for a dirtier environment. They ought to be banned and people should learn to either recycle or reuse them or fail to use them at all. People should use cloth bag for daily uses than plastic bag.
3. **Create legislation that Encourages Environmental Conservation:** Governments should come up with legislation that promotes environmental conservation. This should also be done on an international level, run by international activities such as the United Nation with its UN Environment Program.
4. **Promote a Paperless Office :** Digital computing solutions have enabled companies to become more collaborative, streamlined. Form using desktop applications such as Microsoft office and Google drive for coordinating work projects paper and ink are exchanged out for an eco-conservative alternative

Conclusion

All nations must work together to solve environmental threats of a global nature, and those which undermine sustainability at more local levels of consumption and continue to improve the management of their natural resources. where once we thought endangered species were the problem, we now face the loss of entire ecosystems. Each country must play its fair role, based on the principle of mutual benefit and obligation, and according to its relative technical and economic capacities. Promoting the ecological management and conservation of developing countries. Promote education and awareness among governments and the public. Maintaining the diversity of life in the both human managed and natural systems. Everyone in the world depends completely on earth ecosystem and the services they provide, such as food, water, climate regulation, disease management. So, it is better that care for ecosystem should be taken as one of the major responsibilities of every individual for sustainable living of future generations as well.

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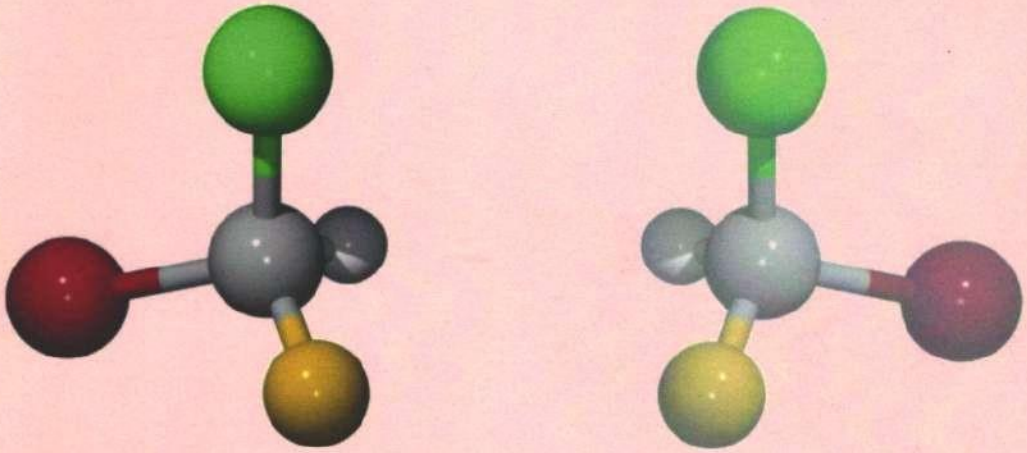

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Edition: First, 15th Jun 2021
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Printed at:
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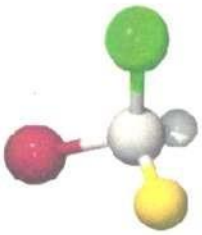
Price: Rs. 200/-



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Publisher

Bhumi Publishing

PLANTA – Vol.-2, 2021: 604 - 609
(Research Book Series – www.pgrindias.in)

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INFLUENCE OF *Chromolaena odorata* (L.) LEAVES EXTRACT ON CARBOHYDRATE AND PROTEIN CONTENT OF *Cajanus cajan* (L.)#

Madane A. N[1], Kenger Y.D [2] and Patel S.I.[3]

Abstract

Carbohydrate status of plants has significant role in improving yield and quality of crop plants. Carbohydrate contents are essential elements for metabolism of plants. Influence of aqueous leaves extract (at 30% and 1% concentration) of Chromolaena odorata was studied on carbohydrate contents of seedlings in pigeon pea in Petri plate under laboratory conditions.The total sugar content in Cajanus cajan was decreased with increase in soaking periods and increasing concentration percentage. In case of starch content in germinating seeds of Cajanus cajan was increased in all treatment ranging from 1 to 30 % and also sprotein content of Cajanus cajan the 1% extract concentration responds to increases protein content. The maximum protein content was observed in after treatment of 1% extract treatment after 6 hours soaking period. The leaves extract concentration increased carbohydrate content decrease in seedlings in Petri plate bioassay.

Key words: Cajanus cajan , Chromolaena odorata , Carbohydrate

#Research Article

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Introduction

Plant nutrition is one of the most important factors in crop production which have an important role in crop production and improve quality of agricultural products. For suitable plant nutrition, every element should be supplied in enough amount for plant growth and balance and respect the ratio between used nutrients. (Alloway, 2008). In agricultural development programs role of micronutrients is important to increase crop yield and quality. Allelopathy also played important role in various types of stress conditions of environment including soil nutrient inadequacy (Al-Wakeel., 2007). Phenolic compounds are involved in alterations of availability of mineral elements in rhizosphere and organic matter dynamics (Makoi and Ndakidemi, 2007).

Materials and Methods

Carbohydrate

Total soluble sugar and starch content was estimated Nelson (1944). 0.5 gram of seedling were extracted in 80% alcohol and filtered through whatman No.1 filter paper using Buchner' s funnel under suction. The filtrate was condensed on water bath to about 2-3 ml. About 2 g of mixture of lead acetate and potassium oxalate (1:1) was added with constant stirring and then the contents were mixed with 20 ml distilled water. It was transferred into conical flask containing 2 ml concentrated HCL. The flask was plugged with cotton and autoclaved for 30 minutes under 15 lbs pressure. After cooling to room temperature, the contents were neutralized by adding anhydrous Na_2CO_3 and filtered again. The volume of filtrate was recorded, and it was used for estimation of total sugars. The residue left on filter paper during the alcoholic extraction was transferred along with the filter paper into conical flask containing 5 ml concentrated HCL and 15 ml distilled water. It was hydrolyzed at 15lbs pressure for 30min and then cooled to room temperature. The contents were neutralized with anhydrous Na_2CO_3 and filtered. The volume of filtrate was recorded. This filtrate was used for the estimation of starch. Estimation of sugar was carried out calorimetrically one ml of Arsenomolybdate regent was added then after cooling the absorbance was recorded at 560 nm on a spectrophotometer against a blank. Standard curve of carbohydrates obtained by using different concentrations of glucose (0.1 mg ml ^{1}) was used to calculate the amount of total sugar and starch present in seeds.

Total Protein

Soluble proteins were estimated from seedling of Cajanus cajan and Cicer arietinum Lowery et al., (1951). 0.5 mg plant material was homogenized in 0.1 M phosphate buffer (pH 7), filtered through moist muslin cloth and centrifuged for 10 min at 5000 rpm, 0.5 ml supernatant was taken in to test tube to prepare an assay, followed by 5ML alkaline copper tartate solution [prepared by mixing of 50 ml of reagent 'a' (2% Na_2CO_3 in 0.1N aqueous NaOH) with 1ml of reagent ' b '(0.5 % $CuSO_4$, $5H_2O$ in 1% Sodium tartate). After 15 min 0.5 ml folinphonol was mixed and it was kept for 30 min at room temperature. Absorbance was recorded at 660 nm against a blank prepared with distilled water. Amount of soluble proteins was calculated with the help of a standard

curve obtained using different concentrations of bovine serum albumin, by similar procedure as employed for plant extract.

Result and Discussion

Carbohydrate content

Total Sugar

***Cajanus cajan* L.**

The effect of Chromolaena odorata extract was tested on total soluble sugar content of Cajanus cajan seedling and depicted in table and fig.

Table: 1. Effect of *Chromolaena odorata* Leaf Extract on Total Sugar Content in *Cajanus cajan* L.

Concentrations	Seed Soaking Period (hr)		
	6	12	24
Control (D.W)	1.6 ± (0.63) [a]	1.4 ± (0.75) [a]	1.3 ± (0.26) [a]
1%	**1.8** ± (0.025) [ab]	**2.1** ± (0.28) [ab]	**2.89** ± (0.74) [ab]
10%	0.4 ± (0.26) [ab]	0.1 ± (0.75) [ab]	0.6 ± (0.42) [a]
20%	0.5 ± (0.85) [a]	0.085 ± (0.36) [a]	0.04 ± (0.14)
30%	0.3 ± (0.75) [a]	0.42 ± (0.35) [a]	0.02 ± (0.23) [a]

Note:
1) Values are mean of three replications and expressed in mg.100g^{-1}.
2) Figures in the parenthesis are according to Duncan's multiple range test (DMRT).
3) Same letter on parenthesis is not significantly different ($P < 0.05$).
4) Above values obtained after 96 hours of germination.

The 1% treatment showed stimulatory effect in all soaking periods as compare to control. i.e. 1.8, 2.1, and 2.89 g-100g^{-1}. The remaining treatments showed inhibitory effect in total sugar as compared to control. Increasing seed soaking period decreases the total sugar value expect in 1% treatment. Total sugar content in 6-, 12- and 24-hour seed soaking period was highly reduced in 20 and 30% treatment. Das et al. (2012) examined allelopathic potentialities of leachates of leaf litter of some selected tree Species on chickpea seeds. They observed that reduction in total soluble sugar content in chickpea seedlings with the treatment of 100% (v/v) leaf leachates of Acacia auriculiformis, A. occidentale, A. lebbek, Eucalyptus citridora, Emblica officinalis, Shorea robusta etc. El-Shora et al. (2015) reported that allelopathic potential of aqueous leaf extract of Trichodesma africanum on germination, growth, chemical constituents and enzymes of Portulaca oleracea. The finding of results that aqueous leaf extract of T. africanum reduced soluble carbohydrate, insoluble carbohydrate and total carbohydrate contents.

Tripathi et al. (1998) was determined the allelopathic action of Tectona grandis, Albizia procera and Acacia nilotica on biochemical development of soybean. The lower

concentration three species showed stimulatory impact on protein, sugars, and proline substance of soybean. (fig-1) The report of these scientists supports to the present work.

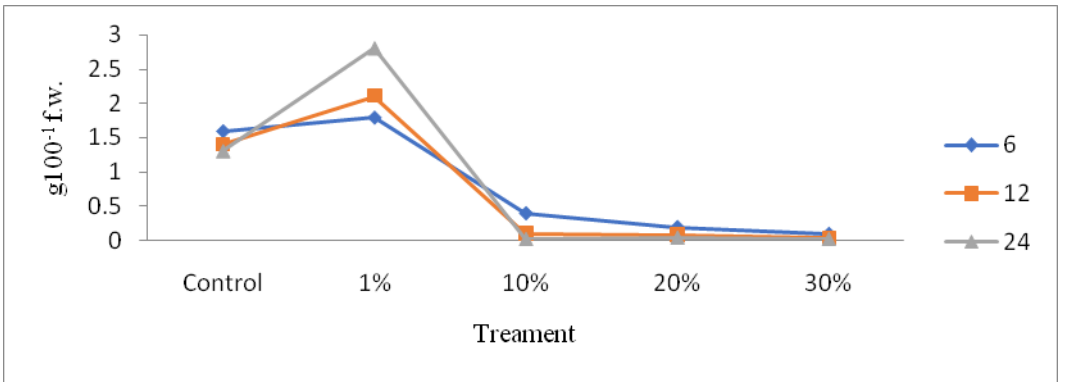

Fig.:1. Effect of Leaf Extract of *Chromolaena odorata* on Total Sugar Content *Cajanus cajan*.

Total Protein

a) *Cajanus cajan*

The total protein in Cajanus cajan after seed treatment with Chromolaena odorata extract was tested.

Table: 2. Effect of Leaf Extract of *Chromolaena odorata* on Total Protein Content in *Cajanus cajan* L.

Concentrations	Seed Soaking Period (hr)		
	6	12	24
Control (D.W)	10.21 ± (0.25)^{a}	12.21 ± (0.29)^{a}	13.11 ± (0.56)^{a}
1%	**11.28** ± (0.28) ^{a}	**12.91** ± (0.26)^{a}	**14.16** ± (0.84)^{a}
10%	9.11 ± (0.54)^{ab}	6.23 ± (0.29)^{b}	5.14 ± (0.89)^{b}
20%	6.26 ± (0.28)^{bc}	4.12 ± (0.24)^{bc}	2.96 ± (0.24)^{c}
30%	3.12 ± (0.56)^{d}	1.16 ± (0.22)^{d}	0.89 ± (0.11)^{d}

Note:
1) Values are mean of three replications and expressed in mg.100g^{-1}.
2) Figures in the parenthesis are according to Duncan's multiple range test (DMRT).
3) Same letter on parenthesis are not significantly different (P < 0.05).
4) Above values were obtained after 96 hour of germination.

The protein content in Cajanus cajan was found to be decreased with increase in concentration and seed soaking periods. The maximum protein content in Cajanus cajan was observed in 1% concentration as compared to all other plant extract, treatments, and control. The minimum protein content was observed after 30% concentration. The lower concentration i.e. 1% enhances total protein content as per increase in seed soaking period. In control condition protein content increase as per increase in seed soaking period but it is exactly reverse in increase concentration treatment.

Pawar and Rawal, (2014) studied the influence of petal leachate of Delonix regia on germination and seedling growth of chickpea, They observed that total soluble protein of chickpea was reduced due to aqueous extract of petal leachate of Delonix regia. Padhy et al. (2000) and Kavitha et.al (2012) allelopathic potential of Eucalyptus leaf litter leachates on germination and seedling growth of finger millet noticed that the leachates of Eucalyptus globulus reduce the protein content in both the root and shoot of finger millet. The present work correlated investigations.

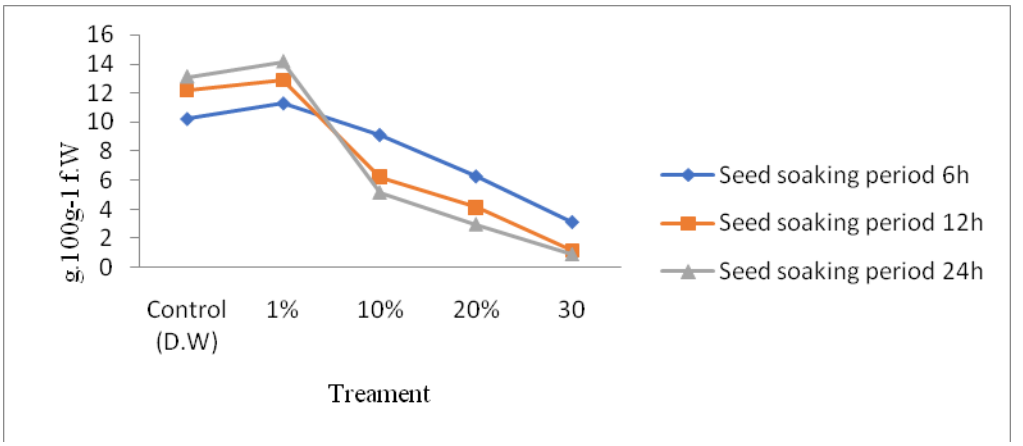

Fig.: 2. Effect of Leaf Extract of *Chromolaena odorata* on Protein Content of *Cajanus. Cajan*.

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E-Commerce : Theory and Practce

by : Prof. Mrs. Kranti S. Patil
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Edition : 2022

ISBN : 978-93-85330-46-9

PRINTED IN INDIA

Research Press India New Delhi - 110002