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Van Sangyan

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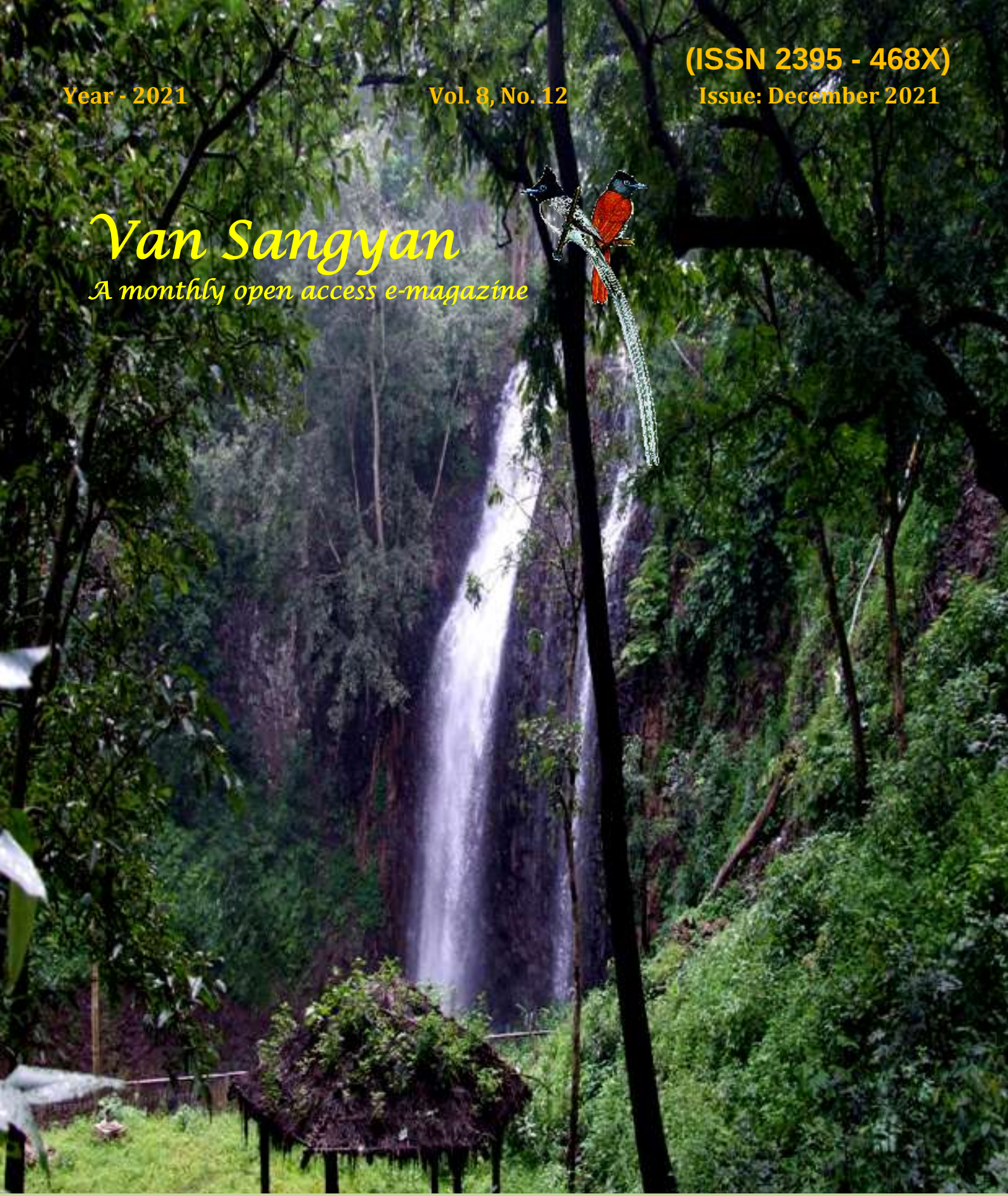

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Van Sangyan

Note to Authors:

We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

by e-mail to vansangyan_tfri@icfre.org

or, through post to The Editor, Van Sangyan,
Tropical Forest Research Institute,
PO-RFRC, Mandla Road,
Jabalpur (M.P.) - 482021.

The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number. TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

Cover Photo: Panoramic view of Achanakmar-Amarkantak Biosphere Reserve
Photo credit: Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

From the Editor's desk

Wooden Handicrafts is a traditional art of creating beautiful items by hand with use of minimal tools. India is famous across the world for having outstanding craftsman that carve such beautiful designs on wooden blocks which itself reflects the shades of traditional style and art. Today, you can see a large number of Handicrafts Items of Wood available in the market and online stores. Among various beautiful handmade wooden items, some widely popular are Wooden Boxes, Wooden Screens, Wooden Gift Items, Wooden Furniture, Wooden Statues, Wooden Toys, Wooden Kitchen Accessories etc.

Items made by artisans from wood for decoration purpose are perfect for you to use on the corner stand or center table of your office, home, hotel and restaurant. While buying wooden handicrafts, ensure that you are picking up the best piece for your money. Best wooden handcraft items must be termite resistive and have splendid finishing. Eminent Wooden Handcrafts Manufacturers are those who properly check their range on smoothness of surface, polishing, designing accuracy etc., make sure that you are dealing with the best one.

Handicrafts are a medium to hold and conserve the rich traditional art forms and heritage along with the talents which are associated with the people's history and lifestyle. The country is blessed with innumerable highly skilled artisans. They have increased the eminence of Indian handicrafts round the globe. They are hugely important in terms of the economic development of the country.

The Indian handicrafts industry incorporates around 7 million artisans and 67000 exporters, who endorse regional art and craftsmanship in domestic as well as global markets. These artisans generally comprise of women and other people belonging to the rural area of India. In other words, this industry employs a number of people from the weaker sections of the society, who earn their livelihood from their creative pieces of art and this way India is guiding the preservation of its artisans, its art and its handicrafts. India may be a manufacturing hub for creating a spread of handicrafts which is additionally famous within the international market. Enjoying the handicrafts of India is a unique way to enjoy its complex culture and many traditions. In this article we will trace the rich and fascinating history of Indian handicrafts because it makes its way across states and borders.

A lot of skill and hard work goes into every piece of Indian wooden handicraft. It mirrors Indian culture, and each handicraft is a masterpiece in its own right. Let's take a peek at the actual process which goes into creating a piece of wooden handicraft. Wood carving is a time consuming process. The time needed by Indian craftsmen to create carved wooden handicrafts may range anywhere from a week (for small items) to a few months (for large items which require elaborate carving techniques).

In line with the above this issue of Van Sangyan contains an article on Wooden handicrafts and its process. There are also useful articles viz. जैविक खेती में फसल सुरक्षा, Isolation and identification of fungal spots in Dendrocalamus strictus, Paectes subapicalis: A major sal defoliator and Extinction of marine species: Cause and solutions

I hope that readers would find maximum information in this issue relevant and valuable to the sustainable management of forests. Van Sangyan welcomes articles, views and queries on various such issues in the field of forest science.

Looking forward to meet you all through forthcoming issues

Dr. Naseer Mohammad

Chief Editor

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Wooden handicrafts and its process

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Introduction

Wood-based industries in India contribute to regional and national economies by way of a value addition and export earning. They also contribute to state and national incomes, and create significant employment opportunities. The government with several incentives and privileges is encouraging wood-based industries in India with a view that these industries can continue to contribute to the national and local economics.

Every manufacturing firm requires a processing cost required for a manufacturing of a product. In most industries, manufacturing costs range from 60 to 70 percent of the final sale price. Therefore, they need for effective processing cost analysis to make a profitable and competitive product.

Wooden Handicrafts industry in India has registered significant growth in the last few years. The industry of Wooden Handicrafts in India reflects the correct shades of rural traditional style and beauty. Wooden Handicrafts in India also reflect the spirit of the rural craftsmanship of the country.

Wooden Handcrafts in India are items that are made out of wood and which carry an artistic and functional value. Wooden Handcrafts in India are made by hand or with the help of simple tools. This is the reason that the industry of Wooden Handcrafts in India requires low investment of capital and various other resources. Wooden Handicrafts industry in India is mainly based in rural areas and small towns. The industry of Wooden Handcrafts in India falls in the group of traditional rural small-scale industry.Wooden Handicrafts industry in India provides huge employment opportunities to the people of the rural areas for this industry is highly labor intensive. In fact, the sector of wooden handcrafts in India is the second biggest employment provider in the country. In the industry of Wooden Handcrafts in India, the rural people who usually work are women and the weaker sections of the society. Thus, the industry helps these people of the villages by making them financially independent.

Major Products

The various products of Wooden Handicrafts industry in India are furniture, boxes, bowls, trays, plates, photo frame, table, chess sets, penholders, wooden cupboards, flower vases, andnapkin rings.

The states where Indian wooden handicraft items are manufactured mostly from Kashmir, Himachal Pradesh, Uttar Pradesh, Rajasthan, Tamilnadu, Telangana and Kerala. Wooden handicrafts are mainly produced in these states because easily available in these states.

Requirements of materials

Species

Mangifera indica, Acacia nilotica, Dalbergia latifolia, Dalbergia sissoo, Tectona grandis, Diospyrosebonum, Pterocarpus santalinus, Santalum album, Givotiarotteleriformis, Populus species & many more species.

Machines

Horizontal Band Saw, Vertical Band Saw, Circular Saw, Jig Saw, Cross Cut Saw, Laser Rip Saw, Two Side Planer, Hydraulic Clamp Carrier, High Frequency Machine, Cold Press Machine, Sliding Table Panel Saw, Disc Sanders, Power Sander, Turnery Lathe, CNC Machine (Router)

Processor for making handicrafts

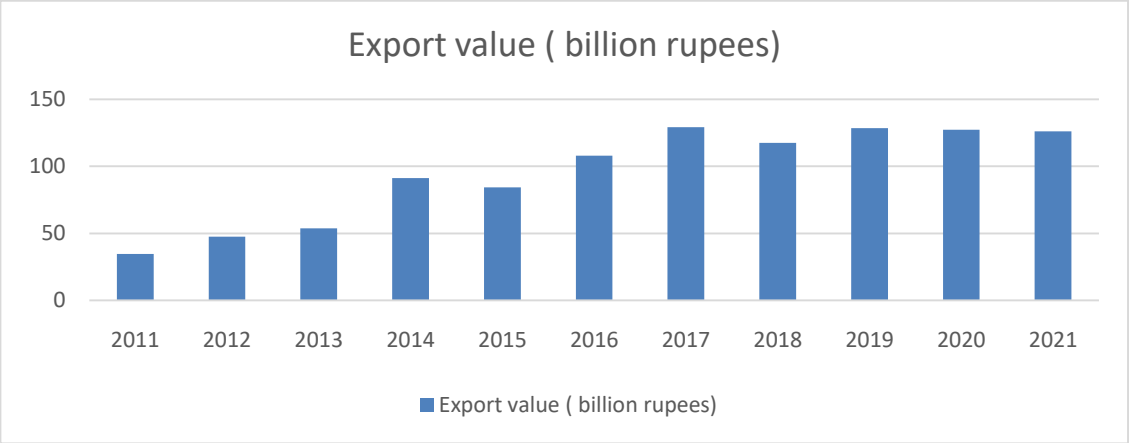
- Import of raw materials from the farm land & timber depot
- Chemical or non-chemical treatments required to remove the defects of wood
- Seasoning (air/kiln) is must for the raw material and after cut into required measurements according to making of different products
- Required shapes should be Outlining/marking on wood is important to prepare products.
- After this, cut the outlined/marked wood and attach them with the help of glue or nail & screw machine.
- Unwanted edges should be removed and sanding should be needed with sandpaper
- Finally finish the product should be with adhesives & paints for protection purpose and glossy finishing purpose.
- Export to the market

Statistics of handicrafts trade and economy

After development of technology Indian handicrafts are exported across geographies, with the top 10 destinations being the US, the UK, the UAE, Germany, France, Latin American countries (LAC), Italy, the Netherlands, Canada and Australia through all online resources like Amazon, Flipkart and many more.

Government of India increased incentive rates under the merchandise export from India scheme (MEIS) to 7% from 5% for handicraft items which will help exporters

to recover the input costs involved in the production of handicrafts and will lead to competitive pricing and boost export.



Conclusion

Wooden Handicrafts industry in India has helped to uplift the condition of the rural people of the country. The government of India thus must take steps in order to ensure that the industry of Wooden Handicrafts in the country continues to grow and prosper. For this in its turn will help the rural people of India to become financially more secure

The industry of Wooden Handicrafts in India has grown very rapidly in the last few years. This has happened due to increase in the export of Indian wooden handicrafts to foreign countries. This has given a major boost to the industry and has also helped to further improve the condition of the rural people. The main countries where Indian wooden handicrafts are exported are USA, UK, Sweden, Singapore, Canada, Greece, and Portugal.

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India: value of handicrafts exports 2021 | Statista

Report on survey of wood-based handicrafts – Rajasthan

Indian Handicrafts: Handicrafts Exports, Industry & Manufacturer in India | IBEF

जैविक खेती में फसल सुरक्षा

ब्रजकिशोर प्रजापति एवं जया प्रजापति
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मृदा विज्ञान एवं कृषि रसायन शास्त्र विभाग
काशी हिन्दु विश्वविद्यालय, वाराणसी (उ.प्र.)

हरित क्रान्ति के आगमन के उपरान्त कृषि के क्षेत्र में उच्च उपज वाली बीज किस्मों एवं रासायनिक उर्वरकों, कीटनाशियों, खरपतवारनाशियों का अंधाधुंध असंतुलित मात्रा में प्रयोग किया जाने के कारण मानव स्वास्थ्य पर इनका विपरीत प्रभाव पड़ रहा है। इन रसायनों के अवशेष फसल उत्पादों में रह जाते हैं तथा खाद्य शृंखला द्वारा मानव शरीर तक पहुंच जाते हैं और विभिन्न प्रकार के रोगों का कारण बनते हैं। हमें इन दुष्प्रभावों से बचने के लिए कृत्रिम रसायनों के विकल्प खोजने की आवश्यकता है। पिछले कुछ समय से जैविक खेती एक बेहतर विकल्प के रूप में उभरी है। स्वस्थ रहने के लिए लोग अब तेजी से जैविक भोज्य पदार्थों को इस्तेमाल में ला रहे हैं। जैविक खेती का लक्ष्य कीड़ो का विनाश करना नहीं है किन्तु उनका आर्थिक स्तर तक नियंत्रण करना है। इसके लिये स्वस्थ कृषि, परिजीवी कीटों, फिरोमोन व प्रकाश प्रपंच, कीट भक्षी पक्षियों,जैवफार्मूलेशन, जैव कीटविनाशको आदि का उपयोग समन्वित रूप से किए जाने के प्रयोग सफल हुए है ।

बीज, बीजोपचार तथा फसल प्रणाली

जैविक खेती के लिए अनुपचारित बीज पहली आवश्यकता हैं। जहां तक संभव हो कीट प्रतिरोधी स्थानीय रूप से उपलब्ध किस्मों का उपयोग किया जाना चाहिए। बीजों को धूप में सुखाकर, 9 प्रतिशत या इससे कम नमी होने परजैविक पदार्थों से उपचारित करके उचित जगह में भंडारित करना चाहिए। फसल प्रणाली को इस तरह से तैयार किया जाना चाहिए कि कीटों का वहन तथा निरंतर प्रकोप ना हो। फसल प्रणाली पोषक तत्वों को सोखने वाली नहीं होनी चाहिए तथा इसमे दलहन फसलों एवं फूलों वाले पौधों को सम्मलित करना चाहिए ताकि पर-परागण बढ़नेसे उपज में भी वृद्धि हो। बुवाई या प्रतिरोपण से पहले 1 लीटर बीजामृत प्रति 10 किलो बीज की दर से किसी भी अन्य जैव-उर्वरक जैसे की एजोटोबैक्टर, एजोस्प्रिलियम, राइजोबियमयफॉस्फोरस विलेयक के साथ मिलाकर बीजोपचार करना चाहिए। प्रतिरोधी फफूंद (ट्राइकोडर्मा विरिडे) को भी 5 ग्राम प्रति किलो की दर से बुवाई के समय बीज मे मिलाया जा सकता है तथा मुख्य फसल के साथ जाल (ट्रैप) फसलों का प्रयोग भी कीटों के नियंत्रण मे सहायक है।

जैव फॉर्मूलेशन्स

एक सर्वेक्षण रिपोर्ट के अनुसार 1500 से अधिक प्रजाति के पौधे कीट निरोधक होते हैं तथा पौध

भक्षण रोकते हैं। कीटों के नियंत्रण के लिए पौधों में व्यवहारिक एवं हार्मोन विरोधी गुण पाए जाते हैं। इनकी क्रिया प्रणाली को देखते हुए भिन्न प्रकार की फार्मूलेशन तैयार की गयी हैं तथा किसानों, छात्रों और अधिकारियों को इनके प्रयोग के लिए प्रोत्साहित किया जा रहा है। ऐसी कुछ महत्वपूर्ण फॉर्मूलेशन्स का विवरण निम्न प्रकार से है।

नीमास्त्रा

नीमास्त्रा टिड्डियों एवं मीली बग्स (कीटाणु) को मारने में असरदार होता है। नीमास्त्रा के मुख्य घटक हैं : 100लीटर पानी, 5 लीटर देसी गाय का गोमूत्र, 5 लीटर देसी गाय का गोबर, 5 किलो कुचले नीम पत्ते।गोमूत्र को 100 लीटर पानी में मिलाएं।इस तरल मिश्रण में 5 किलो गाय का गोबर एवं कुचले नीम पत्ते और उसकी गुदा मिलाएं।इस घोल को 24 घंटे तक सड़ने दें।एक डंडे से एक दिन में दो बार इस घोल को घुमाएं।एक कपड़े से इस मिश्रण को छानें।इस मिश्रण की 2 लीटर नीमास्त्रा 100 लीटर पानी में मिलाएं और उसका फसलों पर छिड़काव करें।

डेरेक अर्क

5 किलोग्राम कटे हुए बकैण (डेरेक यामेलिआ अजादिरच) के पत्तों तथा 2 किलोग्राम गोबर को 5 लीटर गोमूत्र में डालें और अच्छी तरह से मिलाकर कम से कम तीन दिनों के लिए स्टोर करें। अच्छी तरह से हिलाकर, छानकर एवं 50 लीटर पानी मिलाने के बाद यह मिश्रण खेत में प्रयोग किया जा सकता है। इसका 5 प्रतिशत की दर से स्प्रे, चूसने वाले कीड़ों (चेपा, चूरड़ा, माइट्स, मिलीबग) और पत्ती के धब्बे एवंझुलसा रोग के लिए काफी प्रभावी है।

अग्निआस्त्रा

5 किलो कटी हुई नीम पत्तियां,1 किलो कुचले तंबाकू पत्ते तथा 10 लीटर गोमूत्र को 10 लीटर पानी में डालें। इस मिश्रण में 500 ग्राम हरी मिर्च और 500 ग्राम लहसुनमिलाए।इस मिश्रणकोगरम करें और उसे 5 मिनट तक उबलने दें। इस मिश्रण को 24 घंटे तक बंद बर्तन में सड़ने दें।खेत में पत्ती लपेटक एवं छेदक कीटों के खिलाफ उपयोग के लिए 1 लीटर अग्निआस्त्रा को 5 लीटर पानी मिलाने के बाद फसलों पर छिड़काव करें।

देशपर्णी

20 किलो नीम पत्ती + 2 किलोनिर्गुन्डी पत्ते +2 किलो सर्पगंधा पत्ते + 2 किलोगुडुची पत्ते+ 2 किलो कस्टर्ड एपिल (शरीफा) पत्ते + 2 किलो करंज पत्ते + 2 किलोएरंड पत्ते + 2 किलोकनेर पत्ते + 2 किलोआक पत्ते 2 किलो हरी मिर्च लुगदी + 250 ग्राम लहसुन ल गदी + 5 ली. गौमूत्र + 3 किलो गाय गोबर को 200 लीटर पानी में डालें। इस मिश्रण को 10 दिन तक बंद बर्तन में रखने के बाद 5 प्रतिशत की दर से खेत में स्प्रे करें। यह एक जाना माना पारम्परिक कीट निरोधक क्रिया वाला जैव-कीटनाशक है।

ब्रह्मास्त्रा

10 लीटर गोमूत्र, 3 किलो नीम पत्ते, नीम पत्तों की गूदा का 3 लीटर घोल, सीताफल की 2 किलो गुदा, पपीते के पत्तों की 2 किलो गुदा, अनार के

पत्तों की 2 किलो गुदा, अमरूद के पत्तों की 2 किलो गुदा, लेन्टाना कामिल्ला (राई मुनिया) की 2 किलो गुदा और सफेद धतूरा के पत्तों की 2 किलो गुदा।गोमूत्र और नीम के पत्तों की गुदा एक साथ मिलाए।इसमें सीताफल, पपीता, अनार, अमरूद, लेन्टाना कामिल्ला (राई मुनिया) एवं सफेद धतूरा के पत्तों की गुदा मिलाएं और उसे 5 मिनट तक उबलने दें।इसे एक कपड़े में छानें और इस घोल को 24 घंटे तक सड़ने दें।ब्रह्मास्त्राघोल (एक भाग ब्रह्मास्त्रा का घोल 50 भाग पानी में) का चूसक टिड्डियों, फली छेदक और फल छेदक कीटों पर नियंत्रण के लिए इस्तेमाल करें।

नीम गौमूत्र अर्क

5 किलो नीम के पत्तों को पानी में कुचलें। इसमें 5 लीटर गौमूत्र तथा 2 किलो गाय का गोबर मिलायेएवंमिश्रण को 24 घंटे तक सड़ने दें। थोड़े-थोड़े अंतराल से हिलायें। अर्क को निचोड़कर छाने तथा 100 लीटर पानी में पतला करें। रस चूसक वाले कीटों तथा मिली बग का नियंत्रण के लिए इस्तेमाल करें।

मिर्च अदरक का अर्क

1 किलो बेशरम (आइपॉमिआ) पत्ती + 500 ग्राम हरी तीखी मिर्च + 500 ग्राम लहसुन + 500 ग्राम नीम पत्ती। सबको 10 ली. गौमूत्र में कुचलें। इस मिश्रण को तब तक उबालें जब तक कि यह घटकर आधा न रह जाये। अर्क को निचोड़कर छानेएवं प्लास्टिक की बोतल में भंडारित करें। इसघोल की2.5लीटरअर्क को 100 लीटर पानी मिलायेंएवं फसलों पर छिड़काव करें। यह एक एकड़ छिड़काव हेतु पर्याप्त है। यह अर्क पत्ती लपेट कीट, तना, फल तथा फली छेदक के नियंत्रण में लाभकारी है।

गौमूत्र

यह पुराने समय से ही कीटों के खिलाफ इसका प्रयोग किया जाता है। यूरिक एसिड की उपस्थिति के कारण शुद्ध रूप में यह पौधों के लिए जहरीला होता है। इसलिए 15 दिन पुराने गौमूत्र के 10 प्रतिशत घोल का प्रयोग फसलीय पौधों के कीटों से बचाव के लिए सुरक्षित है।

पंचगव्य

4 लीटर गाय के गोबर का घोल तैयार करके उसमे 2 किलोग्राम ताजा गाय का गोबर, 3 लीटर गौमूत्र, 2 लीटर दूध, 2 लीटर दही और 1 किलोग्राम देसी घी डालें। मिश्रण को 10-15 दिनों के लिए एक हवाबंद बर्तन में किण्वन के लिए धूप मे रखें तथा रोज हिलाएं। नर्सरी और पॉलीहाउस में मिट्टी को भिगोने के लिए इसका उपयोग किया जा सकता है। यह 10 प्रतिशत की दर पर प्रयोग करने से विभिन्न रोगों एवं फसलों के कीटों से सुरक्षा प्रदान करता है।

लैंटानाअर्क

इसे 4 किलोग्राम ताजे पिसे हुए लैंटाना के पत्तों को 12-12 लीटर गौमूत्र एवं पानी में मिलाकर तैयार किया जाता है। 15 दिनों के बाद इस घोल को छानकर, फसल कीटों के खिलाफ स्प्रे के रूप में उपयोग किया जाता है। लैंटाना पाउडर को 5 गुना ज्यादा राख या किसी भी अन्य धूल वाहक

के साथ मिश्रित करके छिड़काव करने से भी अच्छे परिणाम मिलते है।

ट्रैप (जाल) फसल

ट्रैप (जाल) फसलें मुख्य फसलें नहीं हैं, लेकिन कीटों को आकर्षित करने या धोखा देने के लिए खेत की परिधि पर लगाई जाने वाली फसलें हैं। ये पौधे आमतौर पर कीटों के लिए फसलीय पौधों से ज्यादा आकर्षक हैं। ऐसी फसलों के कुछ उदाहरण निम्नानुसार हैं-

चूसने वाले कीटों के प्रबंधन के लिए स्ट्रॉबेरी की फसल के आसपास अल्फाल्फा घास की रोपाई की जाती है।

- ग्रीष्मकालीन स्क्वैश का रोपण अच्छे परिणाम देता है।
- साधारण मिर्च, शिमला मिर्च के कीटों को अपनी तरफ आकर्षित करती है।
- टैगेटस (गेंदा) के पौधे लहसुन के थ्रिप्स को अपनी तरफ आकर्षित करते हैं।
- सामान्य गोभी में चीनी गोभी का उपयोग छेदक कीटों को आकर्षित करके मारने के लिए किया जाता है।
- सरसों की फसल के अधिकांश कीटों के प्रबंधन के लिए शलजम के पौधे लगाए जाते हैं।
- दलहन फसलों में मक्का का प्रयोग परिधि फसल के रूप में किया जाता है।
- गोभी में डी.बी.एम. (डायमंड बैक मोथ) के प्रबंधन के लिए जाल फसल के रूप में टमाटर का उपयोग किया जाता है।
- गोभी के तना छेदक का प्रबंधन करने के लिए ट्रैप फसल के रूप में सरसों का उपयोग किया जाता है। टमाटर में अमेरिकन तथा चित्तीदार सुंडी के प्रबंधन के लिए प्रत्येक 10 पंक्तियों के बाद टगेट्स (गैंदा) या ओसीमम (तुलसी) की एक पंक्ति लगाई जाती है।

जैव कीटनाशक

- विभिन्न फफूंद जैसे बिवेरिआ बासियाना और मेटेरहिजियम अनीसोपली का प्रयोग 5 ग्राम प्रति वर्ग मीटर या 1.15 प्रतिशत पाउडर फार्मूलेशन 5 ग्राम प्रति लीटर पानी की दर से, मिट्टी में रहने वाले सभी कीड़ों (कटुआ, भूंड, दीमक) के खिलाफ किया जा सकता है।
- एक अन्य फफूंद, वर्टिसिलियम लेकेनी नरम शरीर वाले कीड़ों (चेपा, चूरड़ा, माइट्स, मिलीबग) के प्रबंधन में बहुत उपयोगी है और वर्टिसॉफ्ट, वर्टिगॉर्ड, बायोलिन, वर्सेटाइल, बायोकैच आदि के नाम से बाजार में उपलब्ध है। सामान्य तौर पर इसका उपयोग 2-3 मि.ली. प्रति लीटर पानी की दर से किया जाता है लेकिन यह फार्मूलेशन के हिसाब से बदल सकती है
- बेसिलस थुरिनजेनसिस (बी.टी.), डाइपेल, डेल्फिन, बायोलेप, बेक्टीन, बायोबिट, बायोएस्प, लिपल इत्यादि जैसे कई नामों से उपलब्ध है तथा इसका प्रयोग 1-2 मि.ली. प्रति लीटर की दर से साप्ताहिक अंतराल पर सभी प्रकार की सुंडियों के खिलाफ किया जाता है।

- कोक्सीनेला सेप्टम्पंक्टाटा (लेडी बर्ड बीटल) चेपा का एक शिकारी कीट है जो व्यावसायिक रूप से उपलब्ध हैं और प्रकृति में बहुतायत से पाया जाया है। कृत्रिम रूप से छोड़े गए क्राइसोपर्ला कारनिया मक्का, सरसों और गोभी फसलों में कीटों के प्रभावी नियंत्रण में सहायक है।
- ट्राइकोग्रामा काईलोनिस एवं ट्राइकोग्रामा जपोनिका अन्य पैरासाइटोइड्स (जो कीटों में रहते हैं, उन्हें मार सकते हैं या नहीं मार सकते हैं लेकिन उन्हें नुकसान पहुंचाते हैं) हैं और व्यावसायिक रूप से पालकर 1.5 लाख/ हेक्टेयर की दर से फसलों के अधिकांश कीटों के नियंत्रण के लिए छोड़े जाते हैं।
- वायरस जैसे न्यूक्लिअर पॉलीहेड्रोसिस वायरस (एन.पी.वी.) अमेरिकन सुंडी, भिंडी छेदक, तम्बाकू की सुंडी के प्रबंधन में लोकप्रिय होते जा रहे हैं तथा बड़े पैमाने परप्रयोग होते हैं। स्पोडोवैक्स, हेलिवैक्स, एनपीवी हाली, एनपीवी स्पोडो आदि इनकी उपलब्ध फॉर्मूलेशन्स हैं। साइटोप्लास्मिक और ग्रैनुलोसिस वायरस का उपयोग भी विभिन्न कीटों के नियंत्रण के लिए किया जा रहा है।
- स्यूडोमोनस, ट्राइकोडर्मा विरिडे, स्ट्रेप्टोमाइसेस, पैसिलोमाइसेस आदि अन्य जैविक प्रतिनिधि हैं जो जैविक खेती में रोगजनकों के खिलाफ काफी लोकप्रिय हो रहे हैं।
- पहले पेट्रोलियम तेल का उपयोग बागवानों द्वारा स्प्रे के रूप में नरम शरीर के कीड़ों के प्रबंधन के लिए किया जाता था। ये तेल अब कृषि फसलों में भी कीट प्रबंधन के लिए नए विकल्प बन गए हैं। इन भारी तेलों को भृंग कीटों एवं सुंडियों के खिलाफ प्रभावीढंग से प्रयोग किया जा सकता है। लेकिन इनके प्रयोग में सावधानी बरतने की जरूरत है क्योंकि इनका उपयोग केवल परिपक्व पौधों पर ही किया जाना चाहिए।

ये सभी क्रियाएं प्रत्येक फसल के प्रमुख कीटों, उनके व्यवहार एवं जीवन में कमजोर कड़ियों और उनके संक्रमण के समय की पहचान करने के लिए मार्गदर्शक का कार्य करती हैं। फसल के आसपास उचित स्वच्छता एवं पर्याप्त निषेचन (फर्टीलाइजेशन) भी कीटों के संक्रमण को हतोत्साहित करते हैं। किसानो को अपनी आर्थिक स्थिति को ध्यान में रखते हुए उपयुक्त प्रबंधन उपाय का चुनाव करना चाहिए।

Isolation and identification of fungal spots in *Dendrocalamus strictus*

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Abstract

One of the most unique and versatile group of plants known to mankind, the bamboos, often called giant grass also known as "poor man's timber" also "green gold". Different parts of bamboos are damaged by many pathogenic fungi, bacteria, viruses and other pathogenic organisms, diseased bark and leaves of *Dendrocalamus strictus* were used for isolation of different fungi and collected from multiplication garden established at Tropical Forest Research Institute, Jabalpur (M.P.). Sample was collected in closed sterile polythene bags during winter season i.e. November 2021. Isolation of fungi was done by using direct method and Potato Dextrose Agar (PDA) medium; the morphological characters of fungi were used for their identification. A total of five fungi were isolated from cultured medium, The identified species of fungi mainly belong to Division : Ascomycota or the sac fungi is the largest phyla in the fungi kingdom containing highest number of species which are both parasitic and saprobic in nature, these were *Aspergillus niger, Penicillium chrysogenum, Fusarium solani, Aspergillus oryzea, and Aspergillus flavus*. The fungi that were distinguish based on culture characteristics and staining experiments were performed with pure cultures of Lactophenol cotton blue-stain fungi in Petri dishes, Identification of fungi was done with the help of published literature, books. The present findings will be helpful for knowing the cause of damage by various fungi and management in Dendrocalamus *strictus.*

Key-words: Isolated, Green gold, PDA, Pathogenic.

Introduction

Bamboos are woody perennial grass belong to family Poaceae. Bamboos are known as 'poor man's timber' in India and play an important role in the rural livelihood and economy. For centuries, bamboos have been closely related to the agriculture, cottage industries, arts, culture and day-to-day life of more than half of the world's population. Recently, bamboos have also entered highly competitive markets in the form of pulp for paper and rayon, parquet, plybamboo and as a canned vegetable. Till recently, bamboos were categorized as minor forest produce or even treated as weeds. Bamboos are vulnerable to various diseases and disorders, which affect them in nurseries, plantations, as well as in natural stands. About 170 species of bamboos belonging to 26 genera are are reported to be affected by various diseases and disorders (Mohanan, 1997). A total 440 fungi, three bacteria, two viruses one phytoplasma (mycoplasma-like organism) and one bacteria like organism have been reported to be associated with various diseases and disorders in bamboo.(Mohanan and Liese, 1990; Mohanan 1994; 1997, 2004).

Bamboos forms a significant component of natural vegetation in many states and occurs in tropical evergreen, semi-evergreen, and moist-deciduous forest, subtropical hills, and also as southern-moist bamboo brakes (Mohanan, 1994).

The Disease development is mainly depends on three conditions, these are susceptible host plant, favorable environment, and an active, living pathogen must be present (Pscheidt and Ocamb, 2016). Therefore, majority of cases fungal infection causes necrosis of the host plant tissue and showed some abnormality in plant.

Dendrocalamus strictus is a giant bamboo species that has been extensively cultivated across tropical and temperate regions of the world (PROTA, 2015; USDA-ARS, 2015). It is a multipurpose bamboo used as raw material in paper mills, for light construction, furniture, musical instruments, agricultural implements, rafts, baskets, and household utensils. Young shoots are edible and consumed by humans. Leaves are used as forage and in traditional Asian medicine (Guadua-Bamboo, 2015). Deciduous, densely tufted bamboo; culms 7–17 m, (3) 6–10 cm in diameter; internodes 30–45 cm, white powdery; wall thick, culm often solid. Branches several. Culm sheaths deciduous, orange-brown, approximately 3/4 as long as internodes, thickly papery, margins ciliate, apex rounded; auricles absent; ligule 1–3 mm, serrulate; blade erect, narrowly triangular. Leaf sheaths initially sparsely hairy, becoming glabrous; ligule short, serrulate; blade usually narrowly lanceolate, (Flora of China Editorial Committee, 2015; Flora of Pakistan, 2015). The information about disease causing fungi from different parts of bamboo is incomplete. Therefore, isolation and identification of fungi from different parts of bamboos is still an essential step towards understanding ecosystem communities (Hyde et al., 2002). The work was an attempt to find out the isolation and identification of fungus to get knowledge about the exact disease-causing fungi.

Materials and Method

Site description and collection

Diseased leaf and bark of *D.strictus* was collected from Multiplication garden established at Tropical Forest Research Institute, Jabalpur (M.P). Sample was collected in closed sterile polythene bags, during winter season i.e. November 2021.

Sterilization of glassware and chemicals

Media and glassware and petridishes were sterilized in an autoclave at a pressure of 15 lbs for 30 min., sterilized laminar airflow with 70 % alcohol and other equipments such as needle, forceps, inoculating loop etc.

Preparation of media

Potato Dextrose Agar (9.75gm /250 ml Distilled water) media was used for the culture. The media was sterilized in an autoclave at 15 psi for 20 minutes after cooling 10 mg of antibiotic (150 mg/l of streptomycin) was added for prevention of contamination of bacteria.

Inoculation and incubation

The media was then poured into the sterile plates and allowed to cool, inoculation of fungal samples with the help of needle, forceps from bark and leaf spot into agar medium in triplicate manner for each sample, then sealed with paraffin tape to avoid contamination. Petridishes were allowed to incubate at 25 ºC for 7 days in laboratory incubator until the colonies grew. To avoid contamination, Petri dishes were stored upright, as inverted dishes can transfer the spores to the lid.

Re-inversion of the Petri dishes for inspection or removal of the lids may liberate spores into the air or onto the benches and cause serious contamination problems (Pitt and Hocking, 1997).

Identification of fungi

Slides were prepared using and lacto-phenol cotton blue stain as mounting medium. Slides were observed under compound microscope (Labovision) and micro-photography was also done. Fungi were identified on the basis of morphological characters of spores by using standard literature (Nagamani et al., 2006) and published literature, mycological manual (Barnett, hypomycetes, C.V. Subramanian, ICAR).

Results

In the present study total five fungal species were identified from infected bark and leaf samples of *D. strictus* from TFRI campus Jabalpur. The identified species of fungi mainly belong to Division : Ascomycota. The isolated genera of fungi were identified on the basis of microscopic characters (Table 1) and isolated genera were; *Aspergillus niger, Penicillium chrysogenum, Fusarium solani, Aspergillus oryzea, and Aspergillus flavus*.

a. The colony morphology of *Aspergillus niger* in fig 1 (A1) reveals sulphur yellow colour colony and microscopic photograph shows in (A2).

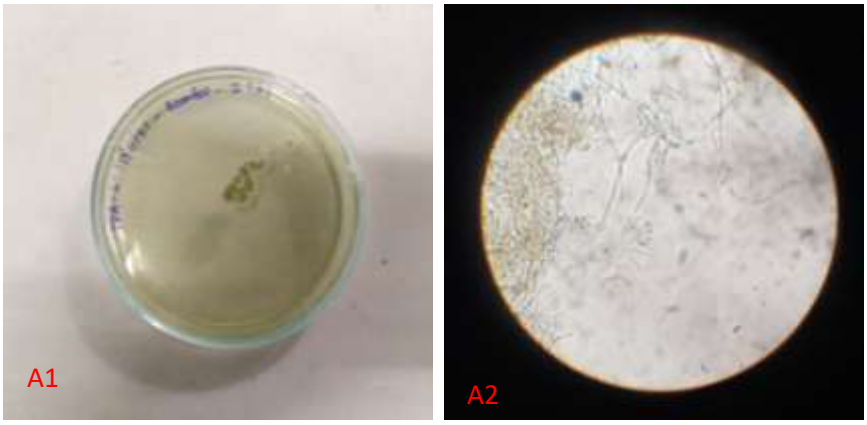

Fig 1. *Aspergillus niger* colony feature on PDA.

b. The colony morphology of *Penicillium chrysogenum* in fig 2 (B1) reveals yellow green to bluish green colour colony and microscopic photograph shows in (B2).

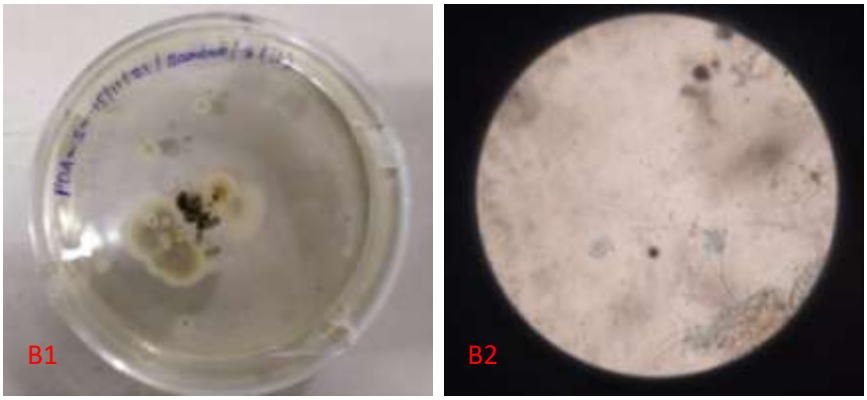

Fig 2. *Penicillium chrysogenum* colony feature on PDA

c. The colony morphology of *Fusarium solani* in fig 3 (C1) reveals pale white creamy to white grayish colour colony and microscopic photograph shows in (C2).

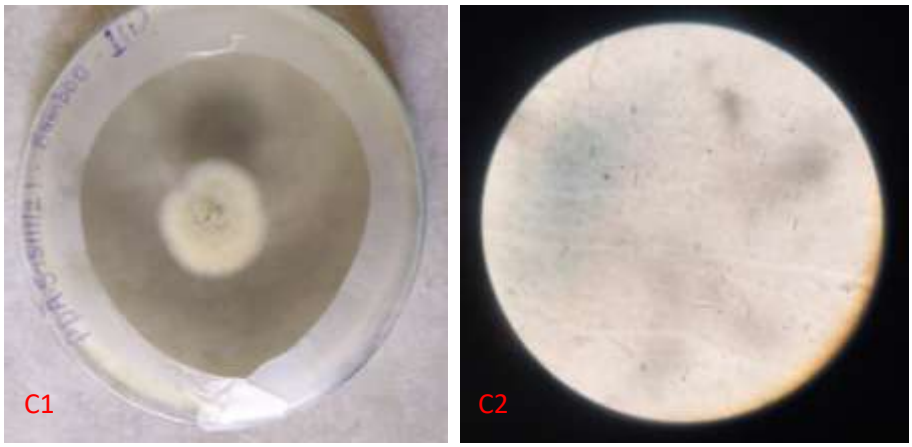

Fig **3. *Fusarium solani* colony feature on PDA**

d. The colony morphology of *Aspergillus oryzea* in fig 4 (D1) reveals lime green to greenish yellow colour colony and microscopic photograph shows in (D2).

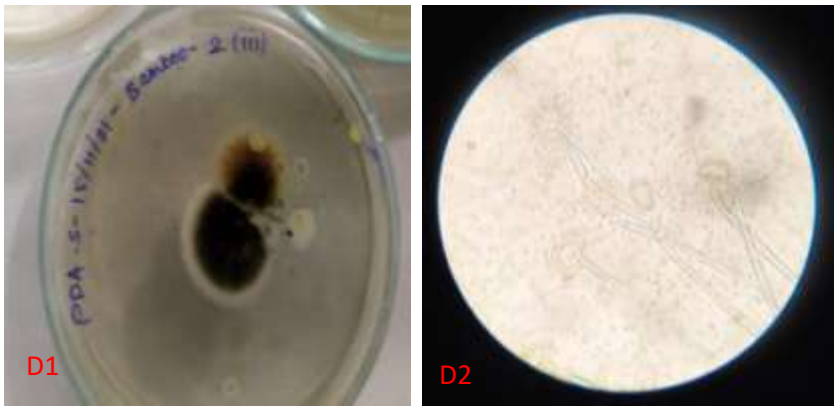

Fig 4. *Aspergillus oryzea* colony feature on PDA

e. The colony morphology of *Aspergillus flavus* in fig 5 (E1) reveals Ivy green to citron green colour colony and microscopic photograph shows in (E2).

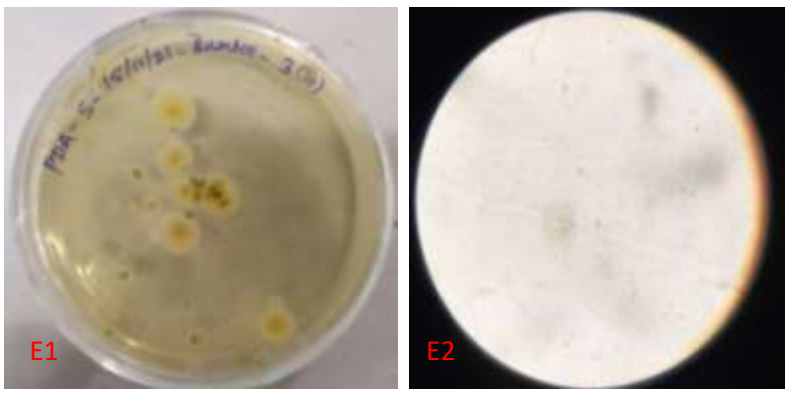

Fig 5. *Aspergillus flavus* colony feature on PDA

Table 1: List of Fungal species identified during the studies

Sr No	Isolated fungi	Division	Order	Family	Microscopic observation
1.	*Aspergillus niger*	Ascomycota	Eurotiales	Trichocomaceae	Rapidly growing with abundant submerge mycelium, black colour colony sometimes colourless but in some strains in yellow colour in hyphae and in substratum, conidiophores mostly arising directly from substratum, conidial head fuscous, blackish brown.
2.	*Penicillum chrysogenum*	Ascomycota	Eurotiales	Trichocomaceae	Colonies were in yellow green to bluish green colour, bearing crowded conidial structure, conidiophores arising primarily from substratum in dense stand, smooth walls and colourless, penicilli biverticillate and asymmetrical.
3.	*Fusarium solani*	Ascomycota	Hypocreales	Nectriaceae	Colonies were in white creamy to white greyish colour. Produced two types of asexual spores macro & micro conidia, resting sporers namely chlamydospores shape of macroconidia is sickle shaped & microconidiais round to oval shaped with blunts end.
4.	*Aspergillus oryzea*	Ascomycota	Eurotiales	Trichocomaceae	Vegetative mycelium mostly submerged, lime green to greenish yellow colour colony,

					conidiophores pitted or rough, colourless walls, phialides are directly on vesicle or on metulae.
5.	*Aspergillus flavus*	Ascomycota	Eurotiales	Trichocomaceae	Colonies were slightly floccose, Ivy green to citron green colour colony, conidiophores mostly arising from submerge hyphae, walls pitted, rough, almost spiny in appearance.

Discussion

The present study dealt with the isolation and identification of fungal spots in *D. strictus* at Multiplication garden established at TFRI campus, Jabalpur. Larger number of bambusicolous fungi falls under Ascomycota phylum which proves their great affinity for the bamboos. The occurrence of the diverse mycoflora in the bamboo nurseries A total of five fungal species were isolated in the present investigation. Fungus isolated and identified in infected leaf of *D. strictus was* also recorded by different workers from different parts of plant from all over the world. (O. Schmidt, D.S. Wei, T. K. H. Tang and W. Liese, 2013). The attack on culms is largely affected by fungi which cause rotting and staining (Guha and Chandra, 1979). The prominent fungal diseases in plantations, natural stands, nurseries and storage bamboos are accounted to be culm diseases (rot of emerging and growing culm, culm stain, culm spot), foliar diseases (leaf spot, leaf rust and leaf blight), rhizome diseases (rhizome rot) and sheath diseases (sheath rot and sheath spot). In addition, witches broom, seedling wilt, damping off, culm blight, sooty mold and smut diseases are also recorded (Mohanan, 2002).

Aspergillus niger (black mold), a filamentous ascomycete having ability of fast growth and pH tolerance is most important cosmopolitan fungi associated with postharvest decay of different substrates (Pitt and Hocking, 1997; Perfect et al., 2009; Perrone et al., 2007). *Aspergillus niger* is a member of the genus *Aspergillus* which includes a set of fungi that are generally considered asexual, although perfect forms (forms that reproduce sexually) have been found.

Aspergilli are ubiquitous in nature. They are geographically widely distributed and have been observed in a broad range of habitats because they can colonize a wide variety of substrates, *Aspergillus niger* is also reported to produce ochratoxin A and fumonisin B2 and aflatoxins (Abraca et al., 1994; Schuster et al., 2002; Noonimabc et al., 2009; Al-Abdalall, 2009). The mycotoxins oxalic acid, malformin A and malformin C, have been shown to cause significant growth effects such as root curling and top deformation in plants (Anderegg et al., 1976). *Aspergillus niger* also causes the rotting of plant parts such as bark, leaves fruits .Culm Brown Rot disease of bamboos caused by *fusarium solani*, Pale yellow spots appear on the lower part of the culm. The spots spread

vertically and the upward extension is fast, forming violet-brown to black-brown streaks along the culm. Later, infection spreads all over the basal part of the culm, leading to shrivelling and death of the affected culm. Earlier reports suggested that most of the fungal species causing disease among different plants.

Fungal pathogen *Fusarium* sp. effect a wide variety of hosts at any age of plants. *Fusarium* species is a main causal agent for different plant diseases, like, barley (Leslie and Summerell, 2006), wheat (Gilbert and Fernando, 2004), soybean (Pioli *et al.*, 2004), potatoes (Ali et al., 2005), maize (Leslie and Summerell, 2006), sorghum (Menkir *et al.*, 1996).

Culm staining and decay fungi recorded on stored culms of *D. strictus* caused by *Penicillium chrysogenum* Lenzites striata), etc. (Marcelina 1995). *Penicillium chrysogenum* is widely distributed in nature, and is often found to live on foods and in indoor environments. It is an important filamentous fungus because of its ability to produce large amounts of penicillin (Elander, 2003). The secondary metabolites of P. chrysogenum include various penicillins, chrysogine, xanthocillins, secalonic acids, sorrentanone, and PR-toxin (Hoog et al., 2000). Recently, Singh et al. (2003) reported two novel polyketides xanthoviridicatins E and F from endophytic strain of *P. chrysogenum* isolated from a leaf collected in Peru. Gerhard et al. (2005).

Conclusion

Dendrocalamus strictus is one of the highly used species of bamboo in Tropical &sub-tropical regions, India and it is extensively used as raw material in paper mills and also variety of purposes such as construction, furniture, musical instruments, boards, also young edible shoots are edible and used as food. However, the bamboo clumps are affected by the occurrence of rot diseases, leaf spot diseases and reducing clump producing, *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus oryzea* & *Penicillium chrysogenum* which produces culm stain disease & *Fusarium sp.* mainly causes Culm Brown rot disease and culm base rot .Culm stain and culm spot diseases can be effectively managed by taking chemical control measure by application of fungicides-Copper hydroxide 77 % WP, Copper ocychloride 50 % WP, Mancozeb 75 % WP, Thiran 75 % also Culm brown rot and base culm rot disease of bamboo can be effectively managed by application of fungicides Carbendazim (Bavistin) or mancozeb (Dithane M45) at 0.2% and Bayleton (Tridimefon) 20 % emulsion, Kitazin 40 % emulsion, or thiophanate methyl 70 % wettable powder on infected culms.

Cultural control measures to control fungal diseases, such as proper maintenance of the stands, nurseries. soil treatment before planting, fungicidal treatment at regular intervals, removal of litter and debris from the ground, regular pruning of the shoots and branches, adequate use of tools and implements, burning of infected culms and rhizomes Further studies needed to be undertaken for effective management and control of fungal diseases in order to prevent from spreading of infection in the nearly bamboos. Most of the diseases can be controlled by adopting appropriate cultural measures before onset of mansoon or by prophylactic fungicidal treatment.

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Paectes subapicalis: A major sal defoliator

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Abstract

The present article deals with a potential insect defoliator, *Paectes subapicalis* Walker (Lepidoptera : Noctuidae) in sal (*Shorea robusta*) forests of Madhya Pradesh. The pest profile has been described.

Key words: Sal, *Shorea robusta*, defoliator, *Paectes subapicalis*, Madhya Pradesh

Introduction

Sal (*Shorea robusta* Gaertn. f.) (Family : Dipterocarpaceae), a fairly large deciduous tree having a majestic shining foliage (Fig. 1), is an important timber species of south Asia, found extensively in India and also in parts of Bangladesh and Myanmar (Tewari, 1995). Madhya Pradesh and Chhattisgarh are the important States with extensive sal forests (27, 800 sq.km.) (Fig. 2), distributed mainly in eastern part of the states forming 25% of the total sal forests of the country (Bajpaee, 1982). The predominant sal forests of Madhya Pradesh are in the districts of Anoopur, Dindori, Mandla, Shahdol, Sidhi, Chhindwara, Balaghat and Hoshangabad (Anon, 1997,1998a,b).

Sal entomology has received special attention, since inception of forestry research in India (Stebbing, 1914; Beeson, 1941), because it has a major pest problem. This potential tree species has a highest number of insect fauna among the forest trees. Of about 346 insects recorded on sal, about 155 species are associated with living tree, encompassing mainly defoliators (108), borers (20), seed-feeders (17) and sap-suckers (4) (Stebbing, 1914; Beeson, 1941; Mathur and Singh, 1960; Browne, 1968; Singh and Thapa, 1988; Sen-Sarma and Thakur, 1994; Tewari, 1995; Thakur, 2000; Nair, 2007; Roychoudhury et al., 2007; Roychoudhury, 2015). Rest of the insects feed either on the freshly felled timber or dry timber, including insect species feeding on decaying or rotten wood of sal.

Fig. 1: Sal tree

Fig. 2: Sal forest

Among the 108 insect defoliators of sal, 92 species are belonging to the order Lepidoptera. Of these, 12 species belong to the family Noctuidae which includes *Paectes subapicalis* Walker, the worst defoliator of sal (Stebbing, 1914).

Pest profile

Paectes subapicalis Walker (Lepidoptera : Noctuidae)

Paectes subapicalis (syn. *Ingura subapicalis*) is a defoliator of sal and teak (*Tectona grandis*) (Beeson, 1941) and found in India and Pakistan (Browne, 1968). The larvae are semilooper, smooth bodied, straw coloured suffused with pink at the fore and hind ends of the body (Fig. 3). The head, pronotum and pygidium were observed to be yellowish with moderately distinct one pair of white lines on the middle of the dorsal side of the body. The full-grown larvae are about 26 mm in length. Larvae are observed to be voracious feeder, principally feed on young foliage (Roychoudhury et al., 2007).

Roychoudhury et al. (2007) have also reported that *P. subapicalis* is a potential sal defoliator in Madhya Pradesh. The present article deals with the pest profile of this major insect defoliator in sal forests of Madhya Pradesh.

Fig. 3: Last instar larva of *Paectes subapicalis*

The last instar larva in post-feeding stage or prepupa was observed to be light pink in colour. The prepupal stage exists for a short period of less than one day. The pupa is obtect and brownish in colour. Pupation occur in a cocoon disguised with larval excrement. The pupal period varies from 6-10 days. The adult moth of *P. subapicalis* has been described by several authorities (Hampson, 1894; Beeson,

1941; Holloway, 1985a, b). The diagnostic features of the moths are : colour dark fuscous, grayish brown, forewing with double dark antemedial line incurved below the cell, minute and grey indistinct, orbicular and reniform spot, an obscure waved medial line, a double postmedial line highly angled outwards beyond the cell,with a chocolate patch beyond it on the costa traces of a pale waved submarginal line, a lunulate marginal line (Fig. 4). Hind wing with the basal area pale, the veins and souter area fuscous, a pale patch at anal angle. The wing expense varies from 28-32 mm.

Fig. 4: Adult moth of *Paectes subapicalis*

Field observations reveal sudden population outburst of *P. subapicalis* occurs with the onset of rain in the month of June during the season of peak period of leaf flushing in sal (Roychoudhury et al., 2007). The population build-up reaches its climax immediately and causes heavy damage to host plant, culminating nearly in total defoliation of sal forest (Fig. 5). Beeson (1941) has reported that the first generation appears when the sal comes into leaf and is much more abundant in June than the later generations of the rains and winter. According to Browne (1968), outbreaks of this species resulting in severe defoliation, particularly during the first half of the year, are of frequent occurrence.

Fig. 5: Sal defoliation due to severe infestation of *Paectes subapicalis*

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Extinction of marine species: Cause and solutions

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Plastic pollution is recognized as a severe anthropogenic issue in the coastal and marine ecosystems across the world. Unprecedented and continuous accumulation of growing plastic contaminants into any respective aquatic ecosystem by the anthropogenic sources

causes direct and/or indirect interruption to ecosystem structure, functions, and consequently, services and values. Land-based and sea-based sources are the primary sources of these contaminants in various modes that enter the ocean.

Marine and coastal environment acts as a highly productive zone that consist different kinds of subsystems, such as coral reefs and seagrasses. It is a complex environment with rich biodiversity ranging from various primitive to the advanced organisms. The marine environment is the vast body of water that covers 71 percent of the earth's coverage.

Marine and coastal ecosystems provide different priceless services and values for human wellbeing and other kinds of vertebrate and invertebrate organisms. Provisioning (the domain of food, fiber, wood, water, pharmaceutical components, oil, mineral sources), regulating (carbon sequestration, maintain water quality, climate regulation), supporting (photosynthesis, nutrient cycling, nursery and breeding grounds, oxygen production), and cultural (spiritual and cultural importance, recreation and tourism) services gained from oceans and coastal ecosystems are ecologically and socio-economically imperative.

Plastic wastes are accumulated in the aquatic ecosystems directly and indirectly by different kinds of sources. Land and ocean-based sources are critical sources of plastic pollution in coastal and marine ecosystems through in-situ and ex-situ pathways. Major land-based plastic pollution sources are freshwater input, residential & domestic activities, tourism, and other economic actions, including harbor operations. Over 75% of marine plastic litter items are accumulated from land-based sources. Coastal zone is a highly residential, urbanized, and industrialized area.

Fish, marine mammals, and seabirds are being injured and killed by plastic pollution, and it is believed that 700 species could go extinct because of it. Estimates suggest that at least 267 species worldwide have been affected, including 84% of sea turtle species, 44% of all seabird species, and 43% of all marine mammal species – but there are probably many more. Deaths are chiefly caused by the ingestion of plastics, starvation,

suffocation, infection, drowning, and entanglement.

One in three marine mammals have been found caught up in some type of marine litter - lost fishing gear, nets, and plastic bags for example - and that over 90% of seabirds have pieces of plastic in their stomachs. Seabirds who feed on the surface of the ocean are especially likely to ingest plastics that float, and then feed this to their chicks. One study found that 98% of chicks sampled contained plastics and that the quantity of plastic being ingested was increasing over time.

And even the deepest sea creatures can't escape plastic pollution; samples taken by scientists at the Scottish Association for Marine Science of the Western Isles found that 48% of creatures had plastic in them, at a depth of 2,000 m. It was mostly polyethylene and polyesters from shopping bags and clothing - which makes it was into the water via washing machine wastewater - as well as microplastics, small pieces of plastic that have degraded from larger pieces, and the small plastic beads found in cleaning products.

Plastic has been slowly accumulating in the marine environment since the 1960s, to the point that we now have huge masses of plastic floating in the oceans and other waste plastics washing up on the once beautifully clean beaches around the world. It is estimated that there are 1 million pieces of plastic of varying sizes per square mile, with a further 8 million tonnes of plastic entering the oceans per year.

Much of it is single-use plastics so food packaging and bottles, carrier bags, and other such products. Approximately 500 billion plastic bags are used worldwide per year – that's over 1 million a minute, but this is perhaps unsurprising when the average working life of a carrier bag is considered 15 minutes!

However, its not just large pieces of plastic that are causing havoc with the marine environment. Household and cosmetic products are laced with microplastics designed to scrub and clean, and which are too small to be caught by water filtration systems. The microplastics enter the water every time someone brushes their teeth or scrubs their face with products containing them.

These microplastics, along with nurdles - lentil sized pieces of plastic which are a by-product of various manufacturing products that end up in the oceans as a result of mishandling or accidental spills - can be ingested by ocean wildlife and accumulate up the food chain, even reaching humans. It is also hypothesized that these smaller pieces of plastic can attract toxic chemicals released by industry and agriculture decades ago, the concentration of which also increases up the food chain.

Plastic is cheap and versatile, making it ideal for many applications, but many of its useful qualities have led to it becoming an environmental problem. The human population has developed a disposable lifestyle: it is estimated that 50% of plastics are used once before being thrown away. Plastic is a valuable resource but polluting the planet with it is unnecessary and unsustainable.

There are an estimated 270,000 tons of plastic floating on the surface of the ocean and according to a recent study authored by researchers at Plymouth University; a staggering 700 different marine species are threatened by its presence. More than this, researchers believe that plastic plays a role in rising rates of species extinction.

Around the world, an estimated one million birds and 100,000 marine mammals and sea turtles die each year when they become trapped in plastic or eat it, perhaps mistaking it for a tasty treat. It is one of biggest threats to all whales and dolphins occurring throughout the world's oceans. Research found that 693 species had been documented as having encountered plastic debris, with nearly 400 involving entanglement and ingestion. Between entanglement, ingestion and ecosystem damage, the threat of plastic pollution impacts marine species both large and small.

The strength of an ecosystem is in its diversity. As biodiversity decreases the consequences are profound. Life evolved into a balance where every species has a role to play. There is no surplus in nature, no room for an infinitely growing extractive economy. It is estimated that up to 200 species go extinct every day.

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Around the world abandoned or lost fishing gear is killing countless sea animals and trashing our oceans. According to Elizabeth Hogan, campaign manager with World Animal Protection, each year 640,000 tons of gear are lost and pollute the world's oceans.

Plastics that end up as ocean debris contribute to habitat destruction and entangle and kill tens of thousands of marine animals each year. To limit your impact, carry a reusable water bottle, store food in non disposable containers, bring your own cloth tote or other reusable bag when shopping, and recycle whenever possible.

We know that reefs are suffering at the hands of global climate change due to rising ocean temperatures, as the stress of warm water causes corals to bleach. In addition, scientists now say that chemically based sunscreen can induce the same bleaching response in coral. Studies have shown that oxybenzone and octinoxate are found in over 3,500 sunscreen products, including household

names like Tropicana, Banana Boat, and Coppertone. When corals absorb these chemicals, they have a similar reaction as they would if surrounding water temperatures were to get too warm. In addition, the presence of these chemicals in sea water allows viruses to thrive, putting corals at high risk of catching an infection that could lead to bleaching and death.

Coral farms are on the rise. Coral farming is the process whereby fragments of corals are collected from the local reefs, raised in nurseries until mature, and then installed at the restoration site. After decades of scientific, small-scale, and community-based projects around the world, its been shown to be a viable method for restoring degraded reefs. With the advent of innovative coral farming techniques, now is the time to launch large-scale restoration efforts to revive and protect the valuable coral reef resources that are at risk.

The necessity of mitigation and managing plastic pollution in marine and coastal environments at global, regional, and national scales is widely recognized. Recently, various international organizations and non-profit social groups actively work together with the kind mind of saving the ocean from plastic pollution in different countries and regions. Reuse, Recycle, and Reduction (3Rs) of plastic pollutants, encouraging the collection of re-usable plastic debris, EPR towards manufacturer accountability, eco-friendly programs through Public-Private Partnerships, awareness and capacity building campaigns focusing on the cleaner environment, scientific studies on nature and severity of this emerging environmental issue, and innovations are suggested as ultimate, effective solutions for reducing and controlling the plastic pollution in these valuable aquatic ecosystems.

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