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RECEIPT



Controller General of Patents, Designs &
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Docket No 37166

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RAHUL SALHOTRA LEX ORBIS
CONSULTING PVT. LTD. 709/710,
Tolstoy House, 15-17 Tolstoy Marg, New
Delhi 110001 Email: rahul@lexorbis.com

Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Fee Payment	Remarks
1	201841018530	TEMP/E-1/19586/2018-CHE	8000	13783	Full	Gingerol Composition And A Process For Preparation Thereof

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0000376487	Online Bank Transfer	02806341705201850690	8000.00	1475001020000001

Total Amount : ₹ 8000

Amount in Words: Rupees Eight Thousand Only

Received from RAHUL SALHOTRA the sum of ₹ 8000 on account of Payment of fee for above mentioned Application/Forms.

* This is a computer generated receipt, hence no signature required.

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B3cii)

ADR (Seeds)
100
8/3

Director of Research

TA(3) 37105/17.

Directorate of Agriculture Development and
Farmers Welfare Department
Thiruvananthapuram
Dated: 26.02.2018.

From
Director of Agriculture.

To
Director of Research
Kerala Agricultural University, Thrissur

Sub: Agriculture Department – State Level Committee for release of Crop varieties -
Minutes of the meeting held on 12.12.2017 – forwarding of – reg.

Ref:- Govt. Lr.No. AGRI-AF1/151/2017-AGRI. Dated 08.02.2018.

I am enclosing herewith the approved minutes of the meeting of the State Seed Sub Committee held on 12.12.2017 Saturday at SAMETI, Anayara, Thiruvananthapuram for favour of information and necessary action. Principal Scientists may be instructed to prepare and submit sufficient number of copies of the proposal in the prescribed format with the forms for notification to this office for onward submission to Central Sub Committee on Crop Standards, Notification and Release of varieties of Agricultural and Horticultural Crops for notification. (Details are available at the website www.seednet.gov.in).

Yours faithfully,

Director of Agriculture
Additional Director of Agriculture (CP)
Directorate of Agriculture and
Farmer's Welfare Department
Vikas Bhavan, Thiruvananthapuram-33

DR
21/3/2018

Copy to:
Principal Scientists Concerned.

for DR

3366100/2018

20/02/18



GOVERNMENT OF KERALA

No. AGRI-AF1/151/2017-AGRI

Agri (Farms) Department
Thiruvananthapuram,
Dated:08/02/2018

From
The Principal Secretary to Government

To
The Director,
Department of Agricultural Development and Farmers' Welfare,
Thiruvananthapuram.

Sir,

Sub: Agriculture Department - Convening State Sub-Committee on
Seeds for release of crop varieties- Reg

- Ref: 1) Government letter of even number dated 18/08/2017 and 09/01/2018
- 2) Your letter number TA(3)37105/17 dated 23/08/2017 and 06/01/2018

I am to invite your attention to the references cited and to request you to take necessary action to forward the Seed varieties approved by the State Sub Committee in the meeting held on 02/02/2017 to the Central Sub Committee on Crop Standards for issuing Notification.

Yours Faithfully,

കോതള കെ ജേക്കബ്
അണ്ടർ സെക്രട്ടറി

For Principal Secretary to Government.

Approved for Issue,

Section Officer.

MINUTES OF THE 27TH STATE SEED SUB COMMITTEE MEETING HELD ON

12-12-2017 AT SAMETI, THIRUVANANTHAPURAM

The 27th State Seed Sub Committee meeting was held on 12-12-2017 at SAMETI, Thiruvananthapuram under the Chairmanship of Sri. Teeka Ram Meena, IAS Agricultural Production Commissioner and Principal Secretary (Agriculture). The list of participants is appended.

Sri A M Sunil Kumar, Director of Agriculture and Convener of the committee welcomed the Agricultural Production Commissioner, members of the seed committee, breeder scientists from Kerala Agricultural University and Central Tuber crops Research Institute, Director of Research KAU, Seed Analyst, farmer representatives and Seed industry representatives to the meeting. Since the proposals were received late, the same could not be circulated among the members for critical review and remarks. Hence all the scientists were requested to participate actively in the discussions. Director of Agriculture requested the breeders to submit the proposals for variety release well in advance in future. Variety release in the State should be followed by the notification by Central seed committee and gene preservation for which Department of Agriculture Development and Farmers Welfare would extend necessary support to the breeder scientists. No publicity should be made before presenting the proposal in the State Seed Sub Committee and the protocol for variety release should be strictly followed by the Research Institutions.

In his address, the Agricultural Production commissioner and Chairman of the State Seed Sub Committee expressed that in future the proposals for release of new varieties should be submitted one month in advance to Director of Agriculture for circulation among the members. Critical remarks should be

offered by all members in writing within a week. A consolidated report should be submitted to the Chairman one week before the meeting. If possible, Chairman will hold a meeting of the officials from KAU and the Department three days prior to the date of the next State seed subcommittee meeting. He requested the scientists to present the details of the crop varieties proposed for release during 2017.

I. CROP: Rice

1) MO 23(KAU Pournami):

Dr (Mrs.) S. Leenakumari presented the details of the variety tested under the culture number **KAUM 109-1-2-1(IET 23739)**. This rice variety is semi tall, medium duration, medium tillering with medium bold red kernelled rice. It is moderately resistant to sheath blight and sheathrot diseases. This variety is also moderately resistant to BPH and gall midge. It is a non lodging and photo insensitive rice variety adapted to Kuttanad region of Kerala.

The committee, after detailed discussion, approved Rice MO23 (KAU Pournami) variety for release in Kuttanad region.

2) KAU Manu Ratna:

Dr.(Mrs.)C R Elsy presented the details of the rice culture **HS-16**. This variety is a High yielding photo insensitive short duration rice suited for Kole lands especially during second and third crop season. It is tolerant to stem borer, leaf folder and whorl maggot but susceptible to BLB, sheath blight and gall midge. Total duration is 95-99 days. Average Grain Yield is 4.5 - 5.7 t/ha.

The committee, after detailed discussion, approved Rice variety KAU Manu Ratna for release in Kole region.

3)KAU-VTL-10:

Dr.(Mrs) Veena Vigneswaran presented the details of the culture **KAU-VTL-51-5(IET 25083)**. This is Saline tolerant , non-photosensitive, mutant rice variety suitable for Pokkali region. The variety is similar to the land race Chettivirippu in taste. Seed to seed duration of this variety is 110-115 days. Average Yield is 4200 kg/ha.

The committee, after detailed discussion, approved Rice variety KAU VTL-10 for release in Pokkali region.

4) KAU Supriya (PTB-61)

Dr(Mrs) Faseela Jaffer presented the details of rice **Culture 06-6**. This white rice variety is adapted to the Central zone during Rabi season. The variety is tall, photo insensitive and late maturing (140 days). It is moderately resistant to Stem borer, Leaf folder, Whorl maggot and Blast. Seed to seed duration is 135-140 days. Average grain yield is 6.5 -7.0t/ha and straw yield 11 t/ha.

The committee, after detailed discussion, approved Rice variety KAU Supriya for release in Central zone of the State.

5)KAU Akshaya :

Dr(Mrs) Faseela Jaffer presented the details of rice **Culture 06-14 PTB-62**. This variety is adapted to Central zone during Rabi season. It is tall, photo insensitive, late maturing (140 days) variety moderately resistant to Stem borer, Leaf folder, Whorl maggot and Blast disease. Kernel colour is white. It is tolerant to high temperature and moisture stress. Seed to seed duration is 130-140 days. Average grain yield is 6.5 -7.0t/ha and straw yield 10 t/ha.

The committee, after detailed discussion, approved Rice variety KAU Akshaya for release in Central zone of the State.

6)KAU Jyotsna (VTL-11) :

Dr(Mrs) Shyla raj K S presented the details of this Vyttila rice variety. The variety is adapted to coastal saline regions, Palakkad and Karilands regions. This variety is semi tall, non lodging, short duration resembling the popular rice variety Jyothi. Moderately resistant to BPH and Blast but susceptible to BLB and Stem borer. Seed to seed duration is 100-105 days. Average grain yield is 6.0 -6.5t/ha.

The committee, after detailed discussion, approved Rice variety KAU Jyotsna for release in Coastal area of the State.

II. CROP: Culinary Melon

1)KAU-Vishal : CM-12

Dr(Mrs) Sreelathakumari presented the details of this culinary melon(Sambar vellari- *Cucumis melo* var.*acidululus*) **culture CM-12**. This is a high yielding line with an average yield of 32.95 t/ha. Medium to large cylindrical shaped fruits are harvested at immature stage when it attains maximum size. This variety is a selection from local collection from Kattakkada region of Thiruvananthapuram district adapted to South Kerala.

The committee, after detailed discussion, approved culinary melon variety KAU Vishal for release in Thiruvananthapuram district.

III. CROP: Cucumber (Hybrid)

1)KAU-parthenocarpic cucumber hybrid-1(KPCH-1):

Dr. T. Pradeep Kumar presented the details of this cucumber hybrid. This variety is parthenocarpic and suitable for polyhouse cultivation. It is early maturing with long dark green fruits. Moderate resistance to downy mildew has been reported. Average yield is 1148.17 kg/100 m².

The committee, after detailed discussion, condemned the action of the Breeder in multiplying and selling the seeds of pre released varieties and warned the Director of Research KAU to refrain breeders from such activities in future with instructions not to release, multiply and sell seeds or any planting materials to the farmers prior to the consideration by the State Seed Sub Committee. The committee approved cucumber hybrid variety KPCH-1 for release in the State.

IV. CROP: Vegetable Cowpea

1)KAU- Manjari :

Dr. (Mrs) Anu G Krishnan presented the details of the culture 11/4-7-3-4 vegetable cowpea. This variety is ideal for intercropping, tolerant to mosaic, good culinary characteristics. Pods are light green with red seeds. Days to first harvest 48-50 days. Yield of vegetable pods/plant is 0.495 kg.

The committee, after detailed discussion, approved vegetable cowpea variety KAU manjari for release in special zone of problem areas in the the State.

2)KAU Mithra :

Dr.(Mrs.)Jessy M Kuriakose presented the details of **culture YLB 5**. This variety is suitable for reverine alluvium of central Travancore during September- October, trailing growth habit, 90-130 days duration, attractive long light green pods, deep brown seeds with white speck at one end, Average pod length 78.6 cm. Average yield 20.72 t/ha. Suitable for commercial as well as organic cultivation.

The committee, after detailed discussion, approved Yard Long Bean variety KAU Mithra for release in the Central Travancore region of Kerala.

V. CROP: Tapioca**1) KAU Uthama :**

Dr.G Jayakumar presented the details of this variety. It is a selection from the Vettikavala local collection. It is a short duration variety with erect and branching stem, cylindrical tubers with average yield of 55.6 t/ha. Suitable for upper Kuttanad region.

The committee, after detailed discussion, approved Tapioca variety KAU-Uthama for release in the Upper Kuttanad region in Kerala.

2) Sree Reksha:

Dr.(Mrs)Sheela.M.N from CTCRI presented the details of **culture TCMS-2(CR24-4)**. This is a clonal selection from exotic line introduced from CIAT, Cali, Columbia. Morphological features are non branching with brown stem, dark purple petiole, leaf lobe lanceolate with 7 lobes, cylindrical tubers, tuber skin brown with cream rind and white flesh. This variety has resistance to Cassava Mosaic disease and tolerance to post harvest physiological deterioration. Average yield is 45000 kg/ha.

The committee, after detailed discussion, approved Tapioca variety Sree Reksha for release in the State.

VI. CROP: Cardamom

Dr. M. Murugan presented the details of three cardamom varieties.

1) KAU-PV-3:

Culture S-1 is a clonal selection. Malabar type cardamom with prostrate panicles, pale green pseudo stem, high no of capsules per panicle, long ellipsoid capsules which are parrot green coloured at maturity, high dry recovery, drought tolerant and moderately tolerant to capsule borer. Average yield is 416 kg/ha (dry weight). Suitable for partial shade (50-60%) in the cardamom hills with medium to high organic carbon content soils.

2) KAU- PV-4:

Culture PS-27 is a clonal selection from the open pollinated seedlings. This variety is Malabar type cardamom with prostrate panicle, high number of ovoid capsules per panicle, high dry recovery and drought tolerant. Tolerant to thrips and Capsule borer. Average dry weight yield is 559 kg/ha. Suitable for partial shade (50-60%) in the cardamom hills with medium to high organic carbon content soils.

3) KAU- PV-5:

Culture PI.No.14 is Vazhukka type, semi erect panicle, high no of ovoid capsules per panicle, medium dry recovery, Tolerant to thrips. Average dry weight yield is 594.48 kg/ha.

The committee, after detailed discussion, approved Cardamom varieties KAU-PV-3 and KAU-PV-5 for release in the cardamom growing tracts in the State. KAU PV-4 has

been deferred as the variety has to be tested with definite breeding objectives.

VII. CROP: Pepper

1) Panniyur 9:

Dr. PM Ajith presented the details of **Culture 5308** pepper. This variety is suitable for open condition, hilly tracts and high altitude regions. The variety has Medium maturity, Field tolerance to Phytophthora foot rot, tolerance to drought and cold stress. The variety is susceptible to pollu beetle and lichens. Average yield in hilly areas is 7.2 kg green berries per vine, 2.86 kg dry pepper/vine.

The committee, after detailed discussion, approved Pepper variety Panniyur 9 for release in the State.

VIII. CROP: Garcinia

1) KAU Nithya :

Dr. (Mrs) Anu G Krishnan presented the details of the Malabar Tamarind variety. It is a selection from culture GC 45/90. Plant growth habit is spreading, slightly oblong golden yellow fruit low in tannin content, high acidity and high HCA. This variety has both industrial and culinary usage. Mean dry rind yield from a steady bearing graft tree is 10.11 kg/tree and the dry rind recovery is 9.76%.

The committee, after detailed discussion, approved Garcinia variety KAU Nithya for release in the in the State.

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IX. CROP: Ginger

Dr.(Mrs)Jalaja Menon presented the details of three Ginger varieties.

1) KAU Chandra :

This variety has been developed through somaclonal selection from induced polyploidy of Rio-de-Janeiro.(culture SE86 81). This variety is suited to central area. This is a dual purpose variety for fresh and dry ginger. The variety is high yielding, fresh yield 23.51 t/ha, dry yield 5.23 t/ha and driage- 22.26% bold fingers with less fibre content.

2) KAU Ardra :

This variety is also developed through somaclonal selection from induced polyploidy of Rio-de-Janeiro.(**culture SE86 40**). Suited to central area of the State. This variety is god for fresh ginger and ginger candy. Driage- 19.6% bold fingers, less fibre , tolerant to rhizome rot.

3) KAU Chitra :

This variety has been developed through somaclonal selection from cultivar Himachal Pradesh (**culture SE HP 9**).Suited to central area, good for dry ginger and high yielding. Driage- 23.4% extra bold fingers, less fibre and high starch content.

The committee, after detailed discussion, approved Ginger varieties KAU Chandra and KAU Chitra for release in Central Kerala. Variety KAU Ardra has been deferred for further testing.

X. CROP: Plumbago

1) KAU Swathi :

Dr.(Mrs)M T Kanakamany presented the details of Chethikoduveli (**Accession 23**) variety KAU Swathi. This variety is suited to Central Kerala. Superior root yield of 18.42 t/ha on fresh weight basis (165.8 g/plant). Dry root weight per plant is 72.2 g. This variety has moderate Plumbagin content of 0.51%.

The committee, after detailed discussion, approved Plumbago variety KAU Swathi for release in the Central Kerala.

XI. CROP: Nutmeg

Dr.(Mrs)N. Miniraj presented the details of five nutmeg varieties.

1)KAU-Pullan :

Clonal selection from elite nutmeg plants of a farmer from Thrissur district. High yielding variety. Nut yield/tree (dry) is 22.79kg; Mace yield (dry) per plant is 2.86 kg. Mace oleoresin content is 25.30%.

2)KAU-Kochukudy :

Clonal selection from elite nutmeg plants of a farmer from Thrissur district Clonal selection method, A high yielding Farmer variety. Nut yield/tree(dry) is 20.88kg; Mace yield(dry) per plant is 4.48 kg. Mace oleoresin content is 28.70%.

3)KAU-Mundathanam :

Clonal selection from elite nutmeg plants of a farmer from Palakkad district. A high yielding variety suitable for tropical humid climate with low shade level in the field. Nut yield/tree

(dry) is 19.7kg; Mace yield(dry) per plant is 3.89 kg. Mace oleoresin content is 23.38%.

4)KAU-Poothara :

Clonal selection from elite nutmeg plants of a farmer from Kottayam district. A high yielding variety suitable for tropical humid climate with low shade level in the field. Nut yield/tree(dry) is 22.0kg; Mace yield(dry) per plant is 4.53 kg. Mace oleoresin content is 14.3%.

5)KAU-Punnathanam :

Clonal selection from elite nutmeg plants of a farmer from Idukki district. This variety suitable for tropical humid climate with low shade level in the field. Nut yield/tree(dry) is 19.39kg; Mace yield(dry) per plant is 4.23 kg. Mace oleoresin content is 18.0%.

The committee, after detailed discussion, approved Nutmeg variety KAU Pullan for State- wide release for export oriented cultivation; KAU- Punnathanam for State- wide release for commercial cultivation; KAU-Kochukudy for release in the Thrissur district; KAU Mundathanam for release in Palakkad district and KAU Poothara for release in Kottayam district.

XII. CROP:Greater Yam

1)Sree Nidhi:

Dr.(Mrs)Sheela.M.N from CTCRI presented the details of culture **Da 293**.This variety is developed through clonal selection from a landrace collected from Central Kerala. Duration from planting to harvest is 240-260 days(medium). Plant is a vine climbing upto 4-5 metres. Tubers are medium cylindrical with pink cortex and white flesh without browning. Yield 30t/ha. This variety is tolerant to Anthracnose disease.

The committee, after detailed discussion, approved Greater Yam variety Sree Nidhi for release in the South and Central districts of Kerala.

XIII. CROP: White Yam

Dr.(Mrs)Sheela.M.N from CTCRI presented the details of two white yam varieties.

1)Sree Haritha:

This variety has been developed through hybridization and clonal selection(**culture DrH 657**). Plant is a vine climbing up to 4-5m. Dark glossy unifoliate leaves with wavy margin, medium cylindrical smooth tubers with brown skin and white flesh. Duration from planting to harvest 270-300 days. No major diseases are noticed on this variety but susceptible to scale insect and nematode. Yield 46t /ha.

The committee, after detailed discussion, approved WhiteYam variety Sree Haritha for release in the South and Central districts of Kerala.

2)Sree Swetha:

This variety has been developed through hybridization and clonal selection(**culture DrD 110**). Plant is a vine 30-50 cm bushy variety. Dark green narrow leaves, cylindrical tubers with brown skin and white flesh. Duration from planting to harvest is 240-270 days. No major pests and diseases are noticed on this variety but susceptible to scale insect during storage. Yield 34 t/ha.

The committee, after detailed discussion, approved White Yam variety Sree Swetha for release in the South and Central districts of Kerala especially in sandy soil.

Dr. Indira Devi, Director of Research KAU, addressed the scientists and participants of the meeting. Quality concern is gaining momentum in the State and we have to restructure our research objectives to produce safe to eat food and income related to quality. It is also high time to standardize and streamline our research on perennial crops.

Mrs. Ayisha PP, regional manager, National Seeds Corporation also addressed the participants. Breeders should ensure the notification of the varieties developed by them. She congratulated all the scientists for their achievements.

Sri. Narayanan, farmer representative from Palakkad also addressed the meeting.

In the concluding session, Sri. S. Janardhanan, Additional Director of Agriculture (CP) remarked that the meeting was informative and requested the scientists to produce more varieties suited for problem areas and stress situations, having high yield potential, farmer acceptance etc. Triangular approach involving Government-Research Institutes- Farmer should be considered for the development of agriculture in the State. He congratulated all the scientists who put forth effort in this direction and thanked the Agricultural Production Commissioner and Principal Secretary, other members of the committee and the participants before the meeting was concluded.

The meeting was concluded at 4.30 PM.

Approved by:

M
8/11/18

Agricultural Production Commissioner
and Chairman, State Seed Sub Committee.

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6/11/18

D.A

27th State Seed Sub Committee Meeting held on 12th December 2017 at SAMETI,
Thiruvananthapuram

List of Participants

1. Sri.Teeka Ram Meena, IAS,Agricultural Production Commissioner and Principal Secretary (Agri) Government of Kerala
2. Sri. Sunil Kumar AM, Director of Agriculture
3. Sri. Janardhanan, S, Additional Director of Agriculture(CP)
4. Sri.A.A. Prasad, Additional Director of Agriculture, KSSDA
5. Dr Leena Kumari, Profesor RRS, Mancompu
6. Dr P Indira Devi, Director of Pesearch, KAU
7. Sri.K.V. Narayanan, Farmer representative
8. Sri.Jayakumar G. Assistant Professor, ARS, Thiruvalla
9. Sri.M.Murugan, Professor and Head, CRS, Pampadumpara
- 10.Dr.Shajan. V R, Professor, ARS.Thiruvalla
- 11.Dr S Sarada, Assistant Professor, College of Agriculture, Vellayani
- 12.Dr.Anu G Krishnan, Assistant Professor, RARS, Kumarakom
- 13.Dr.Rini CR, Assistant Professor, ARS, Thiruvalla
- 14.Dr. Jessy M Kuriakose, Professor(Retd), ARS, Thirvalla
- 15.Dr. C R Elsy, Professor, ARS, Mannuthy
- 16.Dr. Ajith PM, AssistantProfessor,
- 17.Dr. Heera G, Assistant Professor,Plant Pathology, PRS, Panniyur
- 18.Dr.Neema V J Professor and Head, PRS, Panniyur
- 19.Sri. T. Sathyan, Teaching Assistant, CRS, Pampadumpara
- 20.Ms. Aswathy, teaching Assistant, CRS, Pampadumpara
21. Ms.Lata Mary George, Senoir Seed Analyst, State Seed Testing laboratory, Alappuzha
- 22.Dr MT Kanakamany, Professor and Head, AICRP on MAP, College of Horticulture ,Vellanikkara
- 23.Dr N Miniraj, Professor , Department of Plantation Crops and Spices, College of Horticulture
- 24.Dr. Jalaja S manon, Assistant Professor. College of Horticulturte, Vellanikkara

B3 (ii) New farm machinery & tools developed during the year 2018 - Multi-brain Slicer Cum die

Minutes of the 40th Zonal Research and Extension Advisory Committee meeting of Central zone held at RARS, Pattambi on 13-07-2018

Inaugural Session

Scientists from Research Stations, KVKs and Colleges of KAU, Officers of State Department of Agriculture, VFPC and farmers attended 40th ZREAC meeting of central zone. Associate Director of Research, RARS, Pattambi, Dr. M. C. Narayanan kutty welcomed the delegates. Director of Research Dr. P. Indira Devi in her inaugural address referred to the changes in agricultural scenario and challenges before the scientific community. Director of Extension Dr. Jiju P Alex highlighted the importance of prioritization of research problems according to varied requirements of farmers. Dr. Pradeep Kumar, Director planning called for thorough discussion of new technologies.

Smt Ushadevi, Project Director, ATMA Ernakulam, Smt Rekha V R, Project Director, ATMA Palakkad and Sri. Sadanandan, PAO Malappuram felicitated the function. They drew attention to the problems faced by farmers.

Associate Director of Research presented the action taken report of 39th ZREAC. Award winners in Agricultural Department and KAU were felicitated by ZREAC. Dr. Israel Thomas, Programme Coordinator, KVK, Palakkad, proposed vote of thanks

Technical session-I Rice and Pulses

Chair person: Dr. P.Indira Devi., Director of Research
Co - Chair person: Dr. Elsy, C.R.,
Rappoteurs: Dr. Faseela, K.V., Dr. Vimi Louis and Ms. Lakshmi Raj

Sl. No.	Topic	Speaker	Remarks
1.	Results of farm trial on rice cultures IET 22095 and Biriyan cheera.	Dr. Sindhumol. P, COH, Vellanikkara	<i>Recommended for presentation before the State sub committee on variety release for Central Zone. Recommended for MLT for state wide release. Cooking quality of Biriyan Cheera to be tested. Origin of this variety to be specified for IPR related issues.</i>
2	Results of farm trial on paired row planting geometry in rice.	Dr. Moosa. P.P, RARS, Pattambi	<i>Recommended for Multi Location Trials</i>
3	Proposal for farm trial on paddy seed priming in Sampoorna KAU Multi mix.	Dr. Thulasi. V, RARS, Pattambi	<i>Farm trial proposal approved. including additional treatment- soil test based recommendation.</i>
4	Proposal for farm trial on foliar application of Sampoorna KAU Multi mix in rice nursery.	Dr. Thulasi. V, RARS, Pattambi	<i>Farm trial proposal approved including additional treatments- foliar application 15 DAS and soil test based recommendation.</i>
5	Soil carbon dynamics in LTFE and PMT.	Dr. Thulasi. V, RARS, Pattambi	<i>Presented for information of the house. Suggested to analyse the data of PMT and LTFE and generate publications.</i>
6	Results of farm trial on efficacy of Acephate 95% SG against brown plant hopper and rice leaf folder.	Dr. K. Karthikeyan, RARS, Pattambi	<i>Recommended for inclusion in POP.</i>

Farm mechanization and post harvest technology

Sl. No.	Topic	Speaker	Remarks
1.	Mini excavator platform (Pontoon type float).	Dr. Preman P S, ARS Mannuthy	Presented for information of the house.
2.	Remote operated power tiller	Dr. Shyla Joseph, ARS Mannuthy	To be discussed in PC group (Farm Power Machinery and Energy)
3.	An attachment to four-wheel riding type rice transplanter for application of bio-fungicide and micro nutrient mixture on mat nursery.	Dr. Shaji James, KCAET, Tavanur	Approved for mention in POP subject to clarification of IPR issues in use of attachments to machinery.
4.	Pineapple harvesting attachment to brush cutter	Dr. Shaji James, KCAET, Tavanur	Approved for mention in POP subject to clarification of any IPR issues in use of attachments to machinery.
5.	Proposal for farm trial on tractor operated coleus and ginger harvester	Dr. Jayan, KCAET, Tavanur	Suggested to incorporate modifications in the field trial to suit cultivation practices followed by farmers.
6.	Multi fruit slicer cum dicer	Dr. Sudheer, K.P COH, Vellanikkara	Approved for mention in POP.
7.	Blancher cum drier for fruits and vegetables	Dr. Sudheer, K.P COH, Vellanikkara	Approved for mention in POP.
8.	A small gadget for covering banana bunches	Dr. Shaji James, KCAET, Tavanur	Approved for mention in POP.

Technical session- IV Fruits

Chair person: Dr. Asha Sankar., ADR (Farms)
 Co - Chair person: Dr. Pushpalatha, P.B., Prof. & Head, BRS Kannara
 Rappoteurs: Dr. Karthikeyan.K., Dr .Abida, P.S and Ms. Safna.

Sl. No.	Topic	Speaker	Remarks
1.	Value added products of banana	Dr. Manju. P. R BRS, Kannara	Recommended for inclusion in POP after discussed in PC group (Post Harvest Technology and Value Addition).
2.	Proposal on jack varieties with special characters	Dr. Manju. P. R BRS, Kannara	Variety Pechippara -Recommended for inclusion POP
3.	Evaluation of selected jack trees for fruit quality	Dr. Ancy Joseph AMPRS Odakkali	Presented for information of the house. Compare the quality data with all the available other types simultaneously. PC group (fruits) to recommend.
4.	Processing technology of Noni fruit	Dr. Ancy Joseph AMPRS Odakkali	Presented for information of the house
5.	Survey on emerging insect pests of banana and jack	Dr. Gavas Ragesh, BRS, Kannara	Presented for information of the house
6.	Proposal for farm trial	Dr. Gavas Ragesh	Proposal for farm trial approved



Treatment of coconut palm wood using inorganic preservatives

E.V. Anoop*, V. J. Jeeshma, T.K. Dhamodaran#, K. Vidyasagar, Surabhi Lukose and Francis Scaria

College of Forestry, Kerala Agricultural University, Thrissur 680656, Kerala, India

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ABSTRACT: Freshly felled coconut wood is very much susceptible to wood boring insects, moulds and stain fungi as it has high levels of sugar, starch and moisture content throughout the trunk. The objective of this study was to develop appropriate preservative methods to protect sawn coconut palm wood from insects and other pathogens under the prevailing eco-climatic conditions in Kerala and to evaluate the effect of different preservative factors on the treatability of coconut wood. Wood samples were treated with inorganic chemicals like Copper Chrome Boron - CCB and Borax Boric Acid – BBA by diffusion and pressure treatment, of which pressure treatment performed better. Diffusion treatment of inorganic preservatives in high and medium density wood showed no significant difference in retention whereas significant difference was observed for penetration percentage. For pressure treatment, retention and penetration were significant in high density wood whereas medium density wood showed only significant retention. Solution concentrations and overall retention and penetration percentage were found to be significantly related. The study found that sawn coconut wood samples could be effectively treated with preservatives complying with the prescribed retention and penetration percentages as per the different standards and therefore, could be used as a potential substitute for conventional timbers and the insect damage was negligible. No incidence of insects, particularly termites and pin hole borers was observed during the graveyard studies.

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KEY WORDS: Sawn coconut wood, diffusion, pressure treatment, preservatives, insects

INTRODUCTION

The coconut palm (*Cocos nucifera* L.) is found along the coastal and inland regions of almost all tropical countries. The uses of coconut palms are almost limitless as it provides food, drink and shelter and raw material to a number of industries (Menon and Pandalai, 1958; Oduor and Githiomi, 2006; Djokoto, 2013). It is one of the world's most versatile

and economically important palms (Moore, 1948; Subramanian, 2003). All the plant parts are used, on account of which, the palm has been regarded as *Kalapavriksham* or Tree of Life or Tree of heaven, a gift from nature to man (ENVIS, 2014). India is one of the largest producers of coconut which comprises 31 per cent of production and 17.6 per cent of the planted area (APCC, 2014). The bulk of country's plantation is concentrated in

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southern states. Kerala has 20.8 per cent of the total geographical area under coconut and accounts for 33 per cent of total coconut plantation in India (GOK, 2015).

Coconut exhibits no secondary growth but, the lateral increase of trunk is due to the multiplication of cells and enlargement of parenchymatic cells and vascular bundles (Killmann, 1993). The unique anatomical features of the coconut wood results in high variation in physical and mechanical properties. Based on density, coconut stem has three distinct zones such as the dermal zone, sub-dermal zone and core region and there is a decrease in the density of wood from the outer to inner as well as base to top portions of coconut (Killmann and Fink, 1996; Fathi, 2014). Density plays a significant role in determining the end use of coconut palm wood (Mead, 2001). Coconut wood has little resistance to wood degrading organisms including insects when it is exposed to the weather, particularly on ground contact. Freshly sawn coconut wood is extremely susceptible to the attack of termites and pin hole borers apart from sap stain fungi.

Seasoning is the first step in the efficient utilization of the timbers, especially in tropical countries. Protection against the ambrosia beetles could be secured after kiln seasoning of coconut wood (George, 1985). The efficacy of preservative treatment depends on the proper choice of preservative chemicals and the treatment process, which ensures the required absorption and penetration of the preservative. Seasoning prior to preservation makes preservative treatment easy and effective. Seasoning and preservation should be regarded as an integral part of timber utilization (ISI, 2001). The coconut trunk remained under-utilized due to its highly perishable nature.

The present study is an attempt to standardize the preservation technologies of coconut wood to increase the durability of coconut wood products with protection from insects and other organisms. The knowledge developed can be used for the industrial production of preserved timbers or manufacturing of products from treated wood. Increased utilization of coconut wood can reduce

the dependency on forests or conventional plantation grown timber and can pave the way for an additional source of income to coconut farmers. Effect of various factors on the treatability of coconut wood as well as variation in retention and penetration in different parts of coconut wood were the objectives of this study.

MATERIALS AND METHODS

Coconut palms (*Cocos nucifera* L.) of age group (30-40 years) of "West Coast Tall" (WCT) variety grown in Thrissur district of Central Kerala (between N 10° 11' 8.16" and N 10° 41' 2.76" latitude; E 75° 58' 2.64" and E 76° 53' 29.04" longitude), was used for the study. Experiments were conducted in the Department of Wood Science, College of Forestry, Kerala Agricultural University, Vellanikkara, Thrissur district, India during 2015 – 2017. Wood was taken from 30 cm above the ground till 4 meters from the top of the palm. Palm trunk was converted into 2 meter logs after cross cutting with the help of a power saw and transported to a saw mill for sawing (Killmann and Fink, 1996). Coconut logs were converted to scantlings of 5 cm x 5 cm cross section and 50 cm length for further analysis. Prophylactic surface treatment was carried out with Borax - Boric Acid (BBA) solution in the ratio of 1: 1.5 (parts per weight) in water at 3 per cent concentration level by dipping and samples were then air dried under shade.

For estimating moisture content, three sticks were taken from each stack randomly and small clear specimens of 2 cm x 2 cm x 2.5 cm dimensions were made according to IS: 1708- - 1986. The samples were weighed with an accuracy of 0.001 in a weighing balance and dried in a hot air oven at a temperature of 103° ± 2°c till constant weight. From the initial and final weight (oven dry weight), moisture content of each specimen was calculated.

Coconut wood samples were sorted into different grades such as low, medium and high density. A pilodyn was used to classify the samples into high and medium density wood materials (Schulte, 1991). Pilodyn is a handy tool weighing about 1 kg which

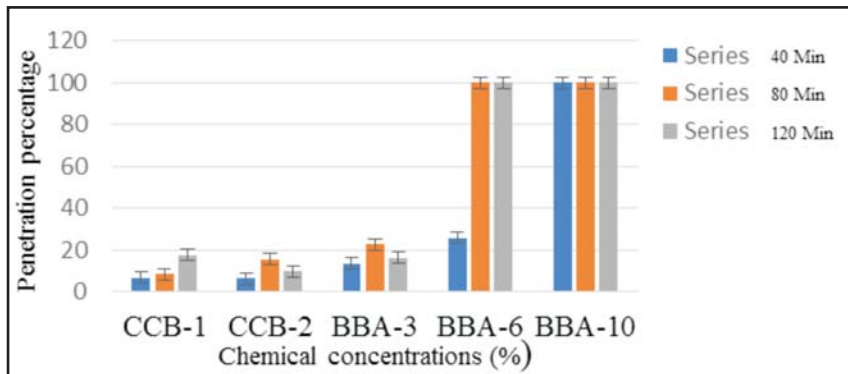


Fig. 1. Variation in DSR with respect to the duration of diffusion treatment in HDW

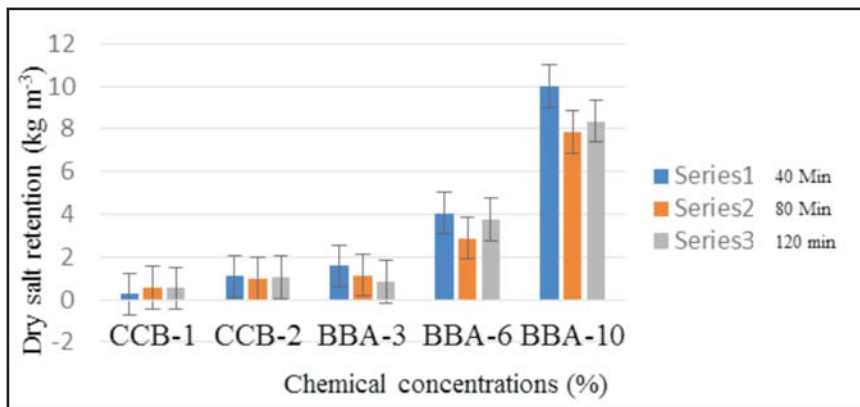


Fig. 2. Variation in penetration percentage with respect to the duration of diffusion treatment in HDW

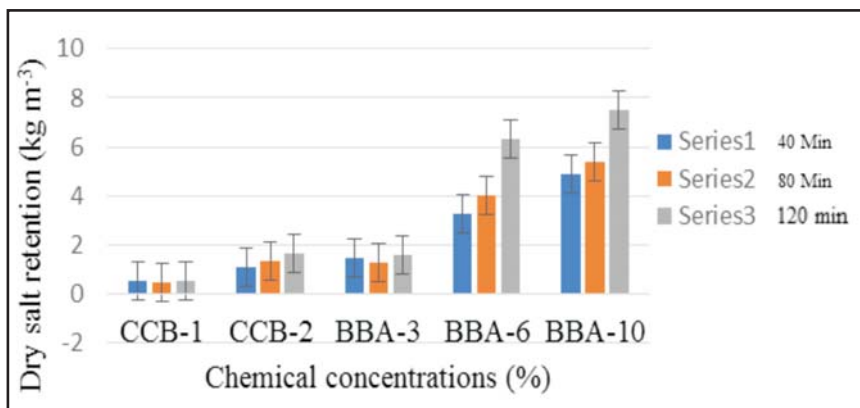


Fig. 3. Variation in DSR (kg m⁻³) with respect to the duration of diffusion treatment in MDW

can be used for indirect non-destructive assessment of basic density of logs as well as standing trees. The pilodyn drives a steel pin which is driven into the wood by releasing a spring with a predetermined energy and the penetration (referred as pin

penetration depth - PPD) is indicated on the instrument. The scale of PPD ranges from 0-40. The depth of penetration is inversely related to the density of the timber and in turn with its modulus of elasticity (MoE) and modulus of rupture (MoR). In

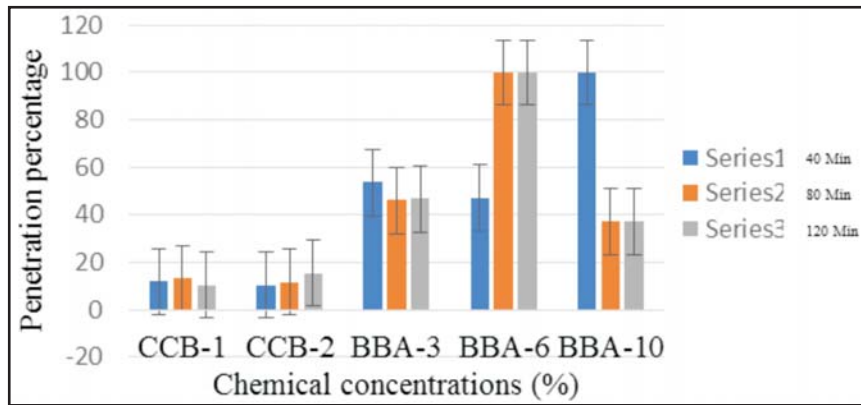


Fig. 4. Variation in penetration percentage with respect to the duration of diffusion treatment in MDW

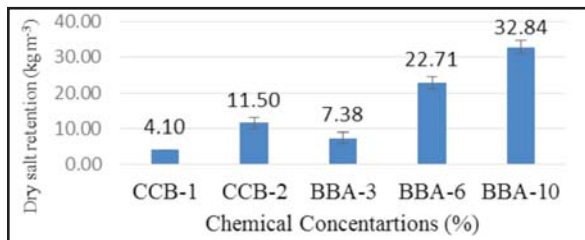


Fig. 5. Variation in DSR with concentration at constant pressure in HDW

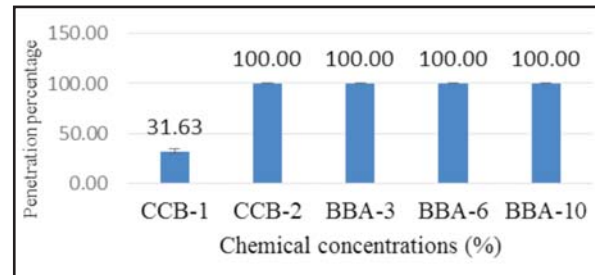


Fig. 6. Variation in penetration percentage with concentration at constant pressure in HDW

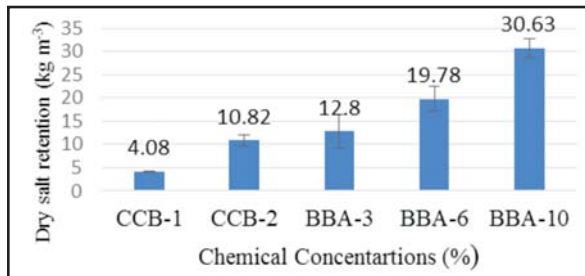


Fig. 7. Variation in DSR with concentration at constant pressure in MDW

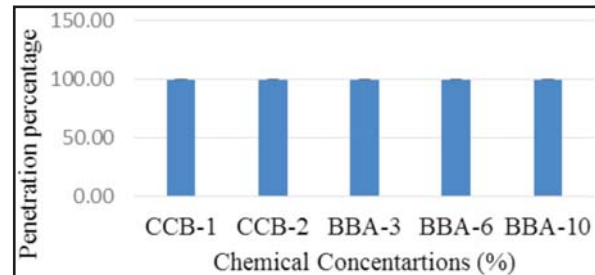


Fig. 8. Variation in penetration percentage with concentration at constant pressure in MDW

the present study, pilodyn (FUJI TECK, Tokyo, Japan) with 6 Joules and 2.5 mm pin diameter was used for taking measurements. The readings were taken at the middle point of each samples and grouped into high and medium density wood on the basis of PPD. All the samples that showed 20 PPD were sorted as high density wood and the readings between 20 to 28 PPD were graded as medium density wood. The samples having reading above 28 PPD were regarded as low density material

which as such could not be used for structural purpose and were hence discarded.

Partially dried wood samples of two density (high and medium) classes were treated with inorganic preservatives - copper chrome boron (CCB) and borax – boric acid (BBA) at various concentrations. CCB was prepared by mixing Copper sulphate, Sodium dichromate and Boric acid in the ratio of 3:4:1.5 (parts per weight) respectively (ISI, 1986).

Two levels of concentration (1 and 2 per cent) were used in the investigation. BBA was prepared by mixing boric acid and borax in the ratio of 1: 1.5 (parts per weight) in water. Three levels of concentration (3, 6 and 10 per cent) were used in the investigation (Gnanaharan and Dhamodaran, 1989).

The treatment methods adopted for the impregnation of chemical into the wood were diffusion and pressure treatment. Duration of diffusion treatment was taken as 40, 80 and 120 minutes respectively. Pressure treatment plant located at the KFRI Substation, Palappally, Thrissur was used and Bethel's full cell process was employed. (Vacuum at 15 inch Hg for 10 minutes and pressure was maintained at 10 kg/cm² for 30 minutes).

After treatment, the evaluation of treatment methods and chemicals were studied by different parameters like, dry salt retention (DSR), penetration depth, diffusion storage period and leaching factor. Treated samples were removed from the tank and excess liquid was drained off for 30 minutes and wrapped in polyethylene sheets for more penetration of chemicals into the wood. 374 samples were analysed and the effect of various diffusion periods on retention and penetration were analysed using two-way ANOVA. Effect of solution concentration at constant pressure was evaluated through one way ANOVA and LSD was used to compare the significance of means.

RESULTS

The effect of factors like chemical concentration, diffusion period and pressure on the treatability of coconut wood was evaluated in this study. Variation in dry salt retention and penetration percentage were compared with the recommended standards to assess potential utilities of the treatments for coconut wood. The major objective of the present investigation was to develop appropriate preservative treatment methods with inorganic chemicals (CCB and BBA) which might help to enhance the service life of coconut wood and protection from wood damaging insects and other organisms. Penetration depth of chemicals in wood

is affected by many factors. Apart from solution concentration and diffusion period, moisture content in the wood, density of the material, temperature etc. also affect the penetration depth (Archer, 1991; Williams, 1991).

Diffusion Treatment

In High Density Wood (HDW), variation penetration percentage of individual samples did not follow any uniform pattern (Fig. 1). Dry salt retention with respect to the duration of diffusion treatment also did not follow any particular pattern (Fig. 2). The chemical concentration was directly proportional to the DSR. The value of DSR ranged from 0.82 kg m⁻³ to 10.76 kg m⁻³ for BBA and from 0.25 kg m⁻³ to 1.09 kg m⁻³ for CCB. For BBA, complete penetration was achieved at 10 per cent and lowest value for penetration was observed as 13.67 per cent at 3 per cent concentration. The penetration percentage of CCB ranged from 6.53 per cent to 17.37 per cent. The achieved DSR was above 10 kgm⁻³ and the retention was achieved at 6 per cent concentration of BBA.

For Medium Density Wood (MDW), analysis of means depicted that with an increase in diffusion period, the chemical retention increased in the wood samples. DSR increased with increasing chemical concentrations for the same duration (Fig. 3). But the individual factors such as chemical concentrations and duration were significant. Chemical strength and interaction between chemical strength and duration were found to be significant for penetration percentage. No significant differences were observed between durations. The values for DSR ranged from 0.44 to 7.49 kgm⁻³ (Fig. 4).

Pressure Treatment

In the case of HDW, increase in chemical concentration of BBA and CCB was directly proportional to DSR (Fig. 5). All the chemical concentrations obtained complete penetration except at one per cent of CCB (Fig. 6). The value of DSR ranged from 5.27 to 35.18 kgm⁻³ for BBA and from 4.03 to 13.23 kg m⁻³ for CCB. Pressure

treatment showed complete penetration of chemicals except CCB at 1 per cent concentration. Chemical concentration was the factor considered in the analysis of DSR and penetration percentage in MDW (Fig. 7 and 8).

DISCUSSION

Diffusion of high and medium density wood showed significant difference for penetration percentage but no differences in retention. In pressure treatment, retention and penetration was significant in HDW, but MDW showed significant difference only in retention. Pressure treatment achieved complete penetration for all solution concentration of the chemicals used. Diffusion treatment of CCB obtained low retention compared to BBA. Only through the application of pressure, CCB attained the recommended retention suggested in the standards. Relation of diffusion period and retention in HDW showed no uniform pattern and followed increasing trend in MDW. Penetration depth followed an increasing pattern with respect to the increasing treatment duration in the two density classes. Low retention and penetration for CCB was achieved for both density classes through diffusion treatment. At 3 per cent BBA, retention achieved was 7.38 kgm^{-3} through pressure treatment which could be achieved through diffusion treatment using BBA at 10 per cent. As far as small scale preservation or furniture unit is concerned, desired retention could be achieved through diffusion treatment and the costs for the expensive pressure plant can be offset by an increase in solution concentration in both HDW and MDW. From the industrial point of view, pressure treatment is superior to diffusion treatment for both density classes. In the case of CCB, the desired retention was achieved at 2 per cent concentration and higher retention was needed for the use of coconut wood in external condition in contact with ground. Increasing concentration of solution or pressure applied can help to achieve higher retention of CCB. In general, the natural durability of coconut ranges from 6 months to 2 years and it needs significant up gradation to meet the requirements. No incidence of insects, particularly termites and pin hole borers was observed during the graveyard

studies being undertaken in continuation of the present study to evaluate the effectiveness of the preservatives. Adequate intervention through preservation which was standardised through this study can expand the service life of coconut wood and thereby augment the supply of durable timbers with lesser durable timbers.

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