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RESEARCH ARTICLE :

# Factors influencing implementation of paddy promotion programmes under different levels of planning

**Salpriya Seby, M.J. Mercykutty and R. Sendilkumar**

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**SUMMARY :** This paper reports on a study conducted in Thrissur district of Kerala State to identify the factors influencing implementation of paddy promotion programmes that could lead to an improved success and sustainability rate for the interventions. Three leading paddy producing blocks from Thrissur district *viz.*, Pazhayanur, Puzhakkal and Anthikkad and from them leading paddy producing Grama Panchayats namely, Chelakkara, Arimpur and Adat, respectively were selected by adopting multi-stage sampling method. Thirty extension personnel were randomly interviewed using pre-tested questionnaire. Factor index was used and the analysis identified resource perspectives and scheme features as the most influencing factors that could determine the success of the implemented schemes though in varying degree as in case of schemes under decentralized planning and Centrally sponsored and State schemes. Also, the individual factor indices thus generated for factors influencing Centrally and State sponsored schemes and those under decentralized planning were compared using independent t- test and was found out that the factors influencing the implementation in both cases were significantly different.

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## BACKGROUND AND OBJECTIVES

Paddy cultivation in Kerala has witnessed a steady decline since the 1980s. The sharp fall in the area under rice cultivation as well as in the quantity of rice produced in the State has important implications for Kerala's economic, ecological and social development. The reduction in rice production will lead to food insecurity, price hike and related socio-economic problems. Over the last few years, however, there have been some signs of revival in rice production in Kerala. Apart from food security, paddy fields are a vital part of Kerala's environment and ecological systems. They provide natural drainage paths for flood waters, conserve ground water, and are crucial for the preservation of a rich variety of flora and fauna. In several regions of Kerala, paddy cultivation is carried out in a manner that

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# Constraint Analysis of Paddy Promotion Programmes under Decentralized Planning

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*ABSRACT*

*A study was conducted in Thrissur district of Kerala, with the objective to find out the constraints felt by the beneficiary farmers and extension personnel while implementing of paddy promotion programmes under decentralized planning. Ex-post facto research design was employed and multi-stage sampling method was followed. Thirty farmers, each identified from three gramapanchayats viz;Adat, Arimpur and Chelakkara and 30 extension personnel representing 3 blocks of Thrissur district were surveyed. Analysis was carried out using Kruskal Wallis test. The dimension wise constraints perceived indicates that financial, time, infrastructural, knowledge, market and scheme feature were the most severe, followed by manpower and input constraints as more severe in Arimpur panchayat. The major constraints perceived by the extension personnel were manpower constraints, financial, scheme feature, input, time and infrastructural constraints, in that order.*

**Keywords :** *Constraints; Paddy promotion programmes; Beneficiaries; Extension personnel*

## INTRODUCTION

Decentralized planning is an approach to balanced development and reduction of regional disparities by giving emphasis to beneficiary participation along with physical and economic factors. The distinctiveness of Kerala's decentralization is that, it has formularized a participatory framework with inbuilt social accountability measures to take in citizen's involvement in local planning and governance in harmony with the national and regional policies. Government of Kerala has been implementing need driven agricultural development programmes under people's planning with the help of Local Self-Government for improving crop production and food security. Major responsibilities are vested with local bodies such as panchayats and the implementation process include coordinating various groups of farmers, agricultural labourers, extension functionaries, social activists and people's representatives. Though the achievement of these interventions have been impressive, there have been issues in implementation that need to be recognized and addressed to ensure the sustainability. The issues faced may differ due to diverse socio-economic and geographic conditions. Keeping this in view the present investigation on constraint analysis of paddy promotion

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# PERCEIVED EFFECTIVENESS OF PADDY PROMOTION PROGRAMMES UNDER DECENTRALIZED PLANNING PROCESS

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*ABSTRACT*

*The study entitled "Perceived effectiveness of paddy promotion programmes under decentralized planning process" was conducted in Thrissur district of Kerala, India. Ex-post facto research design was followed. Thirty beneficiary farmers, each from three major rice producing gramapanchayats of the district viz; Chelakkara, Adat and Arimpur were randomly selected using multi stage sampling technique. Kruskal Wallis test was employed to rank and assess the perception of the beneficiaries. The analysis revealed that the beneficiary farmers from Adat panchayat had a greater perception score, followed by Chelakkara panchayat. The result draws special attention to the mean perception score of the beneficiaries of Arimpur panchayat, which was very low as compared to the beneficiaries of other two studied panchayats. Based on the research findings some suggestions are put forth.*

*KEYWORDS: Perception on Effectiveness, Paddy Promotion Programmes & Decentralized Planning*

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Original Article

## INTRODUCTION

Rice is the staple food of Keralites. Paddy cultivation in Kerala has steadily shrunk due to many factors. But, under the unique system of decentralized planning, decision to devolve 35 to 40% of the plan funds to local governments with the condition that at least 30% should be spent on productive sectors has been made (GOI, 2006).Accordingly, the local governments are taking up many initiatives to promote paddy cultivation to ensure the food security in the State.

The future of paddy cultivation in the State depends mainly on the effective implementation of these development programmes. This implies the need for assessing the success of these programmes. Beneficiary assessment proves to be an effective indicator for this. Considering these aspects, the present study was taken up to assess the perception of the beneficiary farmers on the effectiveness of paddy promotion programmes implemented under decentralized planning. The results of the study suggest suitable modifications for improving the effectiveness of the various paddy promotion programmes.

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# Perception of Farmers on Paddy promotion Programmes under Decentralized Planning- A Case of Adat Grama Panchayat of Thrissur District

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## ABSTRACT

*The major challenge faced by Kerala State is to achieve sustainable rice production for ensuring food security and attaining adequate income to the farmers. Decentralized planning is an approach to balanced development and reduction of regional disparities. The distinctiveness of Kerala's decentralization is that, it has formularized a participatory framework with inbuilt social accountability measures to take in citizen's involvement in local planning and governance in harmony with the national and regional policies. In this context, the present study was conducted in Adat grama panchayat in Puzhakal block of Thrissur district, Kerala. It is one of the major rice cultivating panchayats in the district and has about 3,000 acres of kole paddy fields. The panchayat has successfully launched itself on the organic path to farming and set a model for panchayats elsewhere in the State. Thirty beneficiaries of various paddy promotion programmes were randomly selected. The study intended to analyse the perception of beneficiaries on effectiveness of paddy promotion programmes implemented under decentralized planning as well as the constraints experienced. For analyzing the perception and constraints perception index and Garett ranking technique were employed respectively. The respondents had good perception on effectiveness of paddy promotion programmes implemented under decentralized planning. They had high perception on institutional support aspect. The constraint analysis pointed out that human resource constraint as the major difficulty while practicing the intervention. Appropriate intervention in this area can be made cent per cent successful by overcoming this lacunae. Based on the research findings some suggestions are put forth.*

**Key words:** *Perception on effectiveness; Paddy promotion programmes; Decentralized planning; Constraints;*

Agricultural development programmes are aimed at increasing food supply to feed the rapidly expanding population. The major challenge faced by the Government is to increase the agricultural production especially that of rice with limited natural resources in a sustainable manner for ensuring food security and providing income security to the farmers.

In spite of being the staple food of Kerala, the State has witnessed a steady decline in rice production since the 1980s. The sharp fall in the area under rice cultivation as well as in the quantity of rice produced in the State has important implications for Kerala's economic, ecological and social development. Apart from food security, paddy fields are a vital part of Kerala's environment and ecological systems. They provide natural drainage paths for flood waters, conserve ground water, and are crucial for the preservation of a rich variety of flora and fauna (*Thomas, 2011*).

The local resources, climate and agro-ecological features contribute to the success or failure of any intervention. Hence, decentralized planning for development of agriculture and allied sector is important. Decentralized planning is an approach to balanced development and reduction of regional disparities. The distinctiveness of Kerala's decentralization is that, it has formularized a participatory framework with inbuilt social

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SHORT COMMUNICATION

# SMALL CARNIVORES OF SILENT VALLEY NATIONAL PARK, KERALA, INDIA

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**Abstract:** A study on the small carnivores in Silent Valley National Park (SVNP), southern Western Ghats, Kerala, India was conducted from September 2015 to April 2016, using the camera trap technique. Seven species of small carnivores were recorded during the study. The most common species of small carnivore of SVNP was *Viverricula indica* (44%) followed by *Paradoxurus jerdoni* (20%) and *Herpestes vitticollis* (17%). The other small carnivores found at SVNP were *Herpestes fuscus* (7%), *Prionailurus bengalensis* (6%), *Aonyx cinereus* (5%) and *Martes gwatkinsii* (1%). *P. jerdoni* and *M. gwatkinsii* are endemic to the Western Ghats. We discuss the niche partitioning among small carnivores in SVNP.

**Keywords:** Camera traps, civets, martens, mongoose, otters, small cats, Western Ghats.

The need to undertake biodiversity studies is accelerated by the rapid destruction of forests, particularly in the tropics including the Western Ghats. The number of small carnivore species reported from different protected areas of Kerala vary, e.g., 11 species from Parmbikulam Tiger Reserve (Sreehari & Nameer 2016), nine species from Eravikulam National Park (Nikhil & Nameer 2017), and Wayanad Wildlife Sanctuary (Sreekumar & Nameer 2018). The first record of *Martes gwatkinsii* from Parambikulam Tiger Reserve was reported by Sreehari & Nameer (2013), and the social behavior, feeding habits and activity pattern of *Martes gwatkinsii* were reported from Pampadum Shola National Park (PSNP) (Anil et al. 2018). Sreehari et al. (2013) reported the presence of *Herpestes smithii* in Parambikulam Tiger Reserve and Chinnar Wildlife Sanctuary, and *Herpestes fuscus* in Parambikulam Tiger Reserve and Eravikulam National Park. The lack of details on small carnivores from the Silent Valley National Park (SVNP), except on the sighting records of *M. gwatkinsii* (Christopher & Jayson 1996) and habitat characterization of *M. gwatkinsii* (Balakrishnan 2005), prompted the present study. We report the status and distribution of small carnivores in SVNP.

## MATERIALS AND METHODS

### Study Area

Silent Valley National Park is part of the Nilgiri Biosphere Reserve and has an extent of 237.52km$^2$. The

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# Development of fortified banana pseudostem juice powder utilizing spray drying technology

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**Abstract**

Spray drying technology was optimized for the preparation of milk fortified banana pseudostem juice powder, overcoming the problems of browning and astringent taste. The taste and nutritional value of the powder was increased by blending it with milk, horse gram extract and cardamom powder. Spray drying parameters like inlet air temperatures of 185, 190 and 200° C, constant blower speed and feed speed of 1800 and 15 rpm were selected for the development of milk fortified banana pseudostem juice powder. Functional properties of final powder were analysed for assessing the quality characteristics. Moisture content, water activity, bulk density, colour characteristics and solubility of the powder were assessed by standard procedures. The treatment with 30% horse gram extract, 50% milk and 20% pseudostem juice exhibited appreciable quality enhancement during product analysis. During sensory analysis, the above treatment scored the best. Mineral profile analysis of standardised sample also revealed nutritive value of the trial product.

**Keywords:** Banana pseudostem juice, Fortification, Functional properties, Horse gram, Milk, Spray drying

## Introduction

Spray drying is regarded as one of the most relevant application in food industry, because of its inherent capability to produce powders with minimum quantity of residual solvent and specific size during the entire drying process. Spray drying technique has been extensively used in the development of dried plant parts, plant extracts, by products, etc., both by pharmaceutical and food industries. It is the most widely recognized and monetarily feasible procedure to deliver microencapsulated nutraceuticals economically (Gharsallaoui et al., 2007). It offers protection of sensitive food components from nutritional loss.

In this context, the banana pseudostem, the huge biomass waste produced after the harvest of banana, was utilised for production of spray dried powder along with milk. Banana pseudostem, poses several medicinal properties like, dissolving renal calculi (Prashobh and Revikumar, 2011), assisting detoxification of the body and promoting haemoglobin and insulin production (Sampath et al., 2012). Because of its high content of phenolics and tannins, imparting an astringent flavour to the beverage, its consumption as juice is limited. Moreover, immediate browning reactions due to enzymatic activity is another hurdle in its commercialisation. Despite its medicinal value, attempts were not made to develop a viable product out of this underutilised plant by-product with superior quality and shelf life. This fuelled the interest for development of fortified product from banana pseudostem which might enhance its utility significantly. Present study on fortification of banana pseudostem envisages the inclusion of ingredients like horse gram and milk with cardamom flavour which will enhance the organoleptic properties and health benefits. Keeping

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# Impact of pink pigmented facultative methylotrophic bacteria and synthetic materials on small cardamom (*Elettaria cardamomum* Maton.) under drought

**Sathyan T, Aswathy K Mohanan, Dhanya MK, Aswathy TS, Preethy TT and Murugan M**

**Abstract**
An experiment was conducted at the Cardamom Research Station, Kerala Agricultural University, Pampadumpara, Idukki, Kerala during 2017 summer (February-May) to evaluate the response of small cardamom crop to the foliar application of PPFM and synthetic materials under drought situation. Potassium di-hydrogen phosphate applied plants had higher chlorophyll stability index (90%) compared to others. The highest proline content was obtained with the exogenous application of naphthalene acetic acid, proline, potassium di-hydrogen phosphate and urea respectively. Ferrous sulphate, kaolin and potassium chloride enhanced the population of endophytic fungi. The results have confirmed that potassium di-hydrogen phosphate and potassium containing substances showed consistent superiority over other treatments in mitigating drought stress. The chlorophyll stability index of PPFM was significantly higher than the control and can be a good choice for the organic cardamom growers under drought situation.

**Keywords:** Small cardamom, drought, PPFM, synthetic materials, endophytic fungi, physico-chemical analyses

## Introduction
Small cardamom (*Elettaria cardamomum* Maton), popularly called the queen of spices, is second only to pepper, the king of spices. It is the world's third most expensive spice surpassed in price per weight only by vanilla and saffron (Williams and Olivia, 2014) [13]. India is the second largest producer of small cardamom and plays an important role in the international trade of cardamom. The yield of cardamom is highly dependent on prevailing climatic conditions as the cardamom plant requires intermittent spells of rain and good sunshine during the growth stage. Cardamom production in the country during 2015-16 was estimated as 22 thousand tonnes compared to 18 thousand tonnes in 2014-15. Meanwhile in Kerala, cardamom production has increased by 21.8 per cent in 2015-16 despite the area under cultivation remaining stagnant (Anonymous, 2016) [2]. Cardamom cultivation is considered as a bed of roses with thorns, because both biotic and abiotic stresses play a vital role in lowering its productivity. Abiotic stresses such as rise in temperature, flood, drought and salinity have detrimental effect on yield of cardamom, among which, drought was not a serious problem in previous years. But, now it has became a great threat for cardamom cultivation owing to the failure of monsoon and summer showers. Drought is one of the greatest abiotic stresses to agriculture, inhibiting plant growth and thus reducing productivity (Zhang *et al*., 2008) [15]. Endophytic microbes shown to have several beneficial effects on their host plant, including growth promoting activity, modulation of plant metabolism and phytohormone signalling that leads to adaptation to environmental abiotic or biotic stress. Probably for the first time in small cardamom, the evaluation of different materials on drought mitigation with special emphasis of their effect on foliar microflora and physico-chemical parameters has been advocated.

## Materials and Methods
A field experiment was conducted to evaluate the effect of PPFM, nutrients, growth regulators, anti-transpirants and compatible solutes against the drought stress at Cardamom Research Station, Pampadumpara, Idukki District, Kerala, using cardamom variety Green Gold (*Njallani)* during 2016-2017 (Fig. 1). Two foliar applications were given at 30 days interval during April and May.

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# Virtual Groups: An Effective Tool for Knowledge Sharing and Dissemination

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**ABSTRACT**

A virtual world is a computer-based online community environment that is designed and shared by individuals so that they can interact in a custom-built, simulated world (Bartle, 2003). A group of people who share similar interests and exchange information and ideas via computer networks are called virtual group or online community (Rheingold, 1993). Mousavidin and Goel (2009) developed a conceptual model of virtual group life cycle. In this model, the life of a virtual community is influenced by four elements namely socially shaped aspects, individually demonstrated characteristics, technologically facilitated features and the external influence. Virtual group formats can be broadly classified into virtual groups through social media networks and virtual groups through other media like email, video conferencing, voice conferencing, bulletin board system, drop box, text chat and virtual groups. Most popular virtual groups are virtual groups of social media networks such as facebook, youtube and whatsapp groups. Alexander *et al.* (2003) reported that moral obligations, conducive environment and community interest were motivational factors for contributing knowledge to virtual communities and doubtful nature about accuracy and relevancy of information, fear of criticism and information hoarding were demotivating factors. Virtual groups allow people to bond without being in close proximity either spatially or temporally. It improves interpersonal relationships and facilitates crowd funding. People may use fake identities which often lead to inconsistency and discontinuance of communication. Moreover, authenticity of information in virtual groups also cannot be assured. Hence an appropriate policy to limit the freedoms of users has been the need of the hour.

**Keywords:** Virtual group, virtual world, virtual group formats, virtual group life cycle, motivating and demotivating factors for virtual group participation.

Computer networks allow people to create a range of new social spaces in which to meet and interact with one another. Instead of people talking to machines, computer networks are being used to connect people to people (Wellman *et al.* 1996). In cyberspace the economies of interaction, communication, and coordination are different than when people meet face-to-face. These shifts make the creation of thousands of spaces to house conversations and exchanges between far-flung groups of people practical and convenient. Using network interaction media like email, chat, and conferencing systems like the Usenet, people have formed thousands of groups to discuss a range of topics, play games, entertain one another, and even work on a range of complex collective projects. These are not only communication media, they are group media, sustaining and supporting many-to-many interactions (Licklider *et al.* 1978; Harasim 1993).

The Internet is a strategic research site in which to study fundamental social processes. It provides a level of access to the details of social life and a durability of the traces of social interaction that is unprecedented. It is highly relevant to investigate how social action and organization change as they are refracted through

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# Bioassay for the detection of penoxsulam + cyhalofop butyl residue in soil

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**ABSTRACT**

*Bioassay tests were carried out at Department of Agronomy, College of Agriculture Vellayani during 2014 and field experiments were carried out during kharif 2014 and rabi 2014-15 in farmers field at Kalliyoor Panchayat of Thiruvananthapuram district, Kerala. Response of three test crops, maize, cucumber and sunflower to penoxsulam + cyhalofop butyl revealed that maize was the most sensitive indicator plant and fresh shoot weight of maize was the most susceptible parameter to detect the phytotoxic residue of this herbicide in soil. Bioassay with maize plant in post experiment soil during both the seasons revealed that post emergence application of penoxsulam + cyhalofop even at a concentration of 135 g ha$^{-1}$ did not cause any growth inhibition in fresh shoot and dry weight, shoot length and root length inferring that, the herbicide penoxsulam + cyhalofop butyl 6 % OD (oil dispersion) did not leave any phytotoxic residue in soil and is environmentally safe.*

***Keywords***: Bioassay, indicator plant, maize, penoxsulam with cyhalofop butyl

Bioassays are used to measure the biological response of a living plant to herbicide and to quantify its concentration in a substrate (Rao, 2011). It is a tool that complements the analytical methods and provides information on herbicide residue and its phytotoxicity (Stork and Hannah, 1996). It can be able to detect the herbicide or herbicide residue present in the soil at concentrations high enough to affect the crop growth, yield and quality ( Anon., 2001). It is a major tool for the quantitative and qualitative determination of herbicide residues (Ramani and Khanpara, 2010) and gives a general review of soil-plant-herbicide relationship. Bioassays have advantages in the study of herbicides, because it detects both the active substance and degradation products of the herbicide, it provides information based on the observation of response of plant to herbicide and is the simple, accurate, inexpensive and direct method for determining the herbicide residue in soil.

Biological test requires an indicator organism or species, which are sensitive to a specific herbicide or a class of herbicide. Selecting suitable plant species for bioassay is critical and the plant parameter measured in the bioassay should correlate well with herbicide concentration (Szmigielski *et al*., 2012). For detecting the ALS –herbicides residues, oriental mustard (Szmigielski *et al*., 2008), maize (Mersi and Foy, 1985) and sunflower (Hernandez-Sevillano *et al*., 2001) have been used as indicator plants. Cotton and sugar beet have been reported as the suitable indicator plants for the detection of protox inhibiting herbicides in soil (Grey *et al*., 2007; Szmigielski *et al*., 2009). Szmigielski *et al*. (2012) reported sugar beet as the best indicator plant for the detection of flucarbazone and sulfentrazone herbicides in soil. Cucumber was identified as the best indicator plant for the residue studies of pyrazosulfuron ethyl in soil (Yadav *et al*., 2013). Gowda *et al*. (2003) pointed out that seataria may be considered as the best indicator plant for detecting the residues of fluazifop-p-butyl. Cucumber and sorghum were used as indicator plants for the detection of residues and persistence of oxyfluorfen, oxadiargyl, quizalfop and fenoxaprop-p-ethyl (Ramani and Khanpara, 2010).

An ideal herbicide is one that brings about selective control of weeds for sufficiently long period to get a competitive advantage to the crop and at the same time, dissipates from the soil before the crop season without leaving any residue. Residual problem may arise when these herbicides persist in soil in its original or closely related phytotoxic form for a long time. Hence, it is necessary to check the ill effect of herbicides in the main crop as well as the succeeding crop. With this back ground, the present study was planned to find out the residual effects of post emergence application of penoxsulam + cyhalofop butyl 6 % OD, a combination product of broad spectrum, penoxsulam which belongs to the chemical group triazolopyrimidine sulfonamide inhibiting the biosynthesis of branched chain amino acids in susceptible plants, and cyhalofop butyl, a grass effective herbicide belonging to the chemical group aryloxyphenoxypropionate which inhibits the activity of acetyl coenzyme-A carboxylase (ACCase) leading to growth retardation of weeds using the most susceptible indicator plant.

## MATERIALS AND METHODS

The bioassay experiments were conducted in the crop museum, Department of Agronomy, College of Agriculture Vellayani, Thiruvananthapuram and field experiments were conducted in the farmers' field during

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# Herbicide mixtures effect on weed seed bank in direct-seeded rice

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Bispyribac-sodium + metamifop
Broad-leaved weeds
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Grasses
Penoxsulam + cyhalofop-butyl
Sedges
Weed seed bank

**ABSTRACT**

To study the effect of post-emergence applied herbicide mixtures, *viz.* bispyribac-sodium + metamifop and penoxsulam + cyhalofop-butyl on soil weed seed bank, weed seed bank assay were carried out at College of Agriculture Vellayani, Thiruvananthapuram during rainy season 2014 and winter season 2014-15. Weed seed bank assay results revealed a significant reduction in the emergence of sedges, broad-leaved weeds (BLW) and grasses from the soil treated with herbicide mixtures compared to individual application of bispyribac-sodium at 25 g/ha and penoxsulam at 22.5 g/ha. The results also revealed that penoxsulam + cyhalofop-butyl was more effective in reducing the weed seed bank than bispyribac sodium + metamifop. The higher doses of penoxsulam + cyhalofop-butyl (135, 130 and 125 g/ha) were found to be more effective than its lower dose of 120 g/ha. Among the tested doses of bipyribac-sodium + metamifop, its higher doses (90 and 80 g/ha) performed better than lower doses (60 and 70 g/ha) in reducing the soil weed seed bank. Hence, post-emergence application of penoxsulam + cyhalofop-butyl either at 125 or 130 or 135 g/ha or bispyribac-sodium + metamifop at 80 or 90 g/ha at 15 DAS (days after sowing) can be recommended for the effective management of weed seed bank in wet direct-seeded rice.

## INTRODUCTION

Weed seed bank is the reserve of viable weed seeds present in the soil surface and scattered in the soil profile. Weed seed bank is the main reason for the continued presence of weeds in the agricultural field (Cousens and Mortimer 1995) and it is an indicator of weed population in soil (Dhawan 2007). Annual fluctuations of climatic factors significantly influence the weed seed bank (Harbuck *et al.* 2009). Steinmann and Klingebiel (2004) opined that weed seed bank has impact on the distribution of annual and perennial weeds over the years and it affects the spread of weed community. Weed seed characteristics such as high output, efficient dispersal, longevity and seed dormancy, produce large seed banks in the soil (Pereira *et al.* 2013). Understanding the dynamics of soil seed bank can help in the development of integrated weed management programmes and also help to predict the degree to which the crop-weed competition affects the crop yield and quality (Menalled 2008). Accurate forecast of potential weed seedling density would allow the farmers to implement control measures more effectively thus avoiding inappropriate and over use of herbicides (Mobli and Hassannejad 2013).

Weed seed bank can be manipulated by altering seedling recruitment, seedling mortality, seed viability and fecundity. Manual weeding and herbicidal use reduce the weed population by increasing seedling mortality (Pandey and Pingali1996). Barberi *et al.* (1998) reported that herbicides reduced the weed density and number of weed seeds entering the seed bank. Buhler *et al.* (2001) pointed out that when weeds were controlled by cultivation only, the seed bank was approximately 25 times greater than where herbicides in conjunction with cultivation practices were adopted for weed control. Jain *et al.* (2006) reported that continuous use of clodinafop *fb* 2,4-D and isoproturon + 2,4-D for control of weeds in wheat field significantly reduced the number of weed seeds in the seed bank over weedy check. Walia and Brar (2006) also reported that herbicide treatments significantly reduced the seed bank of *Phalaris minor* in wheat field. According to Islam (2012), herbicide application influenced the seed number and species composition of the seed bank.

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# Proficiency of Post-harvest Treatments in Maintaining Sensory and Organoleptic Quality Attributes of Rambutan (*Nephelium lappaceum* L.) during Ambient Storage

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A B S T R A C T

Water loss is the major problem in rambutan which induces the browning of spinterns and ultimately reduces the consumer acceptance. Techniques which slow down respiration and dehydration rate were found to be more effective in increasing overall acceptability of rambutans. The efficacy of several pre-treatments in up regulating consumer acceptance of rambutan (*Nephelium lappaceum* L.) fruit was examined. Dipping fruits for 5 min in 2 ppm ozonized water comparably reduced the browning of the fruit stored under room temperature (30±2°C; 80-85% RH). On the other hand, waxing treatments did not reduce browning but retained excellent internal fruit quality. Sulphitation (350ppm) solution was not effective in reducing browning and enhancing marketable value. It was concluded that ozonization (2ppm) treatment recorded lowest browning score (4.10) and superior in general appearance (4.83), taste and flavour with minimum pulp browning at the end of shelf life.

## Introduction

Rambutan (*Nephelium lappaceum* L.) is an important exotic fruit, indigenous to Southeast Asia, including Thailand, Malaysia, and Indonesia (Lam *et al.,* 1987). It is a good source of vitamin C, calcium and provides fairly a good amount of niacin, iron, phosphorus, carbohydrate, protein, and fibre. As a non-climacteric fruit, rambutan must be harvested at the peak of maturity as further ripening does not continue after harvest (O'Hare, 1995; Wall *et al.,* 2011). The most attractive and distinctive feature of rambutan fruit is its bright red or yellow peel and spinterns (Landrigan *et al.,* 1996). The flavour of the juicy aril is a blend of sweet and sour taste (Lam *et al.,* 1987). Farmers in many parts of Kottayam and Pathanamthitta in Central Travancore have taken rambutan cultivation to cater the demand of fruits from traders in Tamil Nadu and Karnataka (Kuttoor, 2009). However, the presence of the hair like spinterns makes the fruit very

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# Herbage yield and quality of Neel (*Indigofera tinctoria* L.) as influenced by shade levels and planting dates

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**Abstract:** Experiments were carried out to study the effect of shade levels and planting dates on herbage yield and quality of Neel (*Indigofera tinctoria* L.) during 2012 - 13, 2013 - 14 and 2014 - 15 at Thrissur, Kerala, India. The design was split plot with three main plots and three sub plots. The main plot treatments included three levels of shade *viz*., 25 %, 50 % and open condition and sub plot treatments included three dates of planting viz., 2nd week of August, 2nd week of September and 2nd week of October. The pooled analysis of three years data showed that, *Indigofera tinctoria* can perform well in 25 per cent shaded condition with the highest herbage yield of 5498 kg/ha followed by open condition (5150 kg/ha). The herbage yield decreased significantly with increase in shade. August or September planting recorded higher herbage yield (5279 kg/ha in August planting and 5246 kg/ha in September planting). The quality of *Indigofera*, as indicated by content of glycoside indican, was higher in plants grown under open condition and 25 per cent shaded condition (59.12 and 58.83 kg/ha, respectively). Interaction effect of shade levels and planting dates indicated that *Indigofera* can be planted either in August or in September under open to 25 per cent shaded condition for getting maximum herbage yield and quality.

***Keywords:*** Neel, *Indigofera tinctoria*, Growing conditions, Shade tolerance, Planting dates, Indican

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## Introduction:

Neel (*Indigofera tinctoria* L.) is a medicinal plant recommended for large scale commercial cultivation (Ved and Goraya, 2007). The plant belongs to the family Leguminosae and sub family Papilionaceae. In many countries of the world from cool temperate to tropical climate, it is grown as ornamental, for production of indigo dye and also as herbal medicine (Ellison, 1999). Being a leguminous crop, it improves the fertility of soil through nitrogen fixation and hence suitable for growing as a pure crop in marginal lands, catch crop in rice fallows or as intercrop in plantation crops. The plant exhibits antitoxic, haemostatic, sedative properties and are useful in the treatment of piles, healing of ulcers, dropsy. The roots,

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# A modified protocol for isolation of high quality total RNA from ginger (*Zingiber officinale* Rosc.) rhizomes

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**Abstract**

Ginger rhizomes contain high amount of water, polysaccharides, polyphenols and secondary metabolites which interfere with isolation of total RNA. High quality RNA with sufficient quantity is crucial for conducting gene expression studies. An effective protocol for isolation of RNA from ginger rhizomes is essential. The present study is focused on isolation of high quality RNA from ginger rhizome which can be further utilized for downstream applications like cDNA library preparation and differential gene expression studies. The protocol reported by Kumar et al. (2007) was modified and was compared with the original protocol. The modified protocol was found effective in getting higher quality (A260/A280 – 1.95 to 2.05) and quantity (51-58.6 µg/g) of isolated total RNA from fresh and frozen rhizomes. In the original protocol the quality obtained was (A260/A280 - 1.47 to 1.54) and quantity was 24.0-42.0 µg/g.

**Keywords**: Acid phenol, Ginger rhizome, Modified protocol, Total RNA

## Introduction

Ginger is one of the most important spice crops, valued for its medicinal properties. It has a very big genome of 23,618 Mbp distributed in 22 chromosomes, which is not much exploited (Chandrasekar et al., 2009). To explore the vast genomic information stored in this medicinal herb, post translational modifications and gene expression studies are to be carried out. High quality RNA with sufficient quantity is crucial for conducting gene expression studies. All the downstream applications viz., gene isolation, cDNA library construction, transcriptome sequencing, qPCR analysis, northern blot hybridization, microarray analysis and RNA interference rely on good quality and quantity of total RNA. Due to high instability of RNA, there are chances of degradation during downstream manipulations. Often single stranded, RNA contains ribose sugar that carries a 2'-OH group which is prone to hydrolysis, as compared to DNA which has a 2'-H (Sah et al., 2014).

Considering the above, total RNA isolation from plants becomes more challenging as plants contain cell wall, pigments, tannins, polysaccharides and polyphenols and other secondary metabolites (MacRae, 2007). Ginger rhizomes contain high amount of polysaccharides, polyphenols and other secondary metabolites. Polysaccharides tend to co-precipitate with RNA resulting in low yield of RNA (Deepa et al., 2014). The co-precipitated compounds hinder the downstream activity of enzymes viz., reverse transcriptase, DNA polymerase, and DNA restriction endonuclease, thereby affecting the purification as well as quantification of total RNA (Moser et al., 2004). Secondary metabolites include polyphenols that form covalently linked quinines on oxidation and bind to proteins and nucleic acids in an irreversible fashion (Loomis, 1974). Genomic DNA and protein also make complexes with RNA leading to contamination and difficulty in isolation, resulting in low yield of RNA. Further, biotic and abiotic stresses pose more difficulty in isolating

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# Diversity and endemism of butterflies of montane forests of Eravikulam National Park in the Western Ghats, India

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**Abstract:** In a study on the diversity and abundance of butterflies of montane forests of Eravikulam National Park in the Western Ghats, southern India, 85 species of butterflies belonging to six families were recorded. This include eight species of butterflies that are endemic to the Western Ghats and one Near-Threatened species according to IUCN Red List of Threatened Species. The family Nymphalidae, the brush-footed butterflies, was the major group of butterflies seen in the montane forests of Eravikulam National Park.

**Keywords:** Biodiversity hotspot, conservation, Hesperiidae, IUCN, Lycaenidae, Nymphalidae, Papilionidae, Pieridae, Riodinidae.

The Western Ghats is one of the biodiversity hot spots of the world (Myers et al. 2000). This region is rich in endemism including butterflies and has been of great interest for biogeography. The natural habitats in the Western Ghats is under tremendous pressure from the biotic influences (Jha et al. 2000; Mittermeier et al. 1998). Butterflies are suitable for biodiversity studies, because their taxonomy and geographic distribution are better understood compared to many other taxonomic groups (Pandhye et al. 2012). Butterflies are also regarded as good indicators of habitat quality as many species exhibit habitat preferences and seasonality (Larsen 1988; Kunte 1997). Butterflies are sensitive biota, which get severely affected by environmental variations and changes in forest structure (Pollard 1991). India has around 1,501 species of butterflies, out of which 336 species have been reported from the Western Ghats (Kunte et al. 2018). Of the 336 species of butterflies of the Western Ghats, 316 species have been reported from Kerala (Palot et al. 2012).

Although quite a few studies have been done on the butterflies of the Western Ghats (Gaonkar 1996; Kunte 2000, 2008; Kehimkar 2008; Padhye et al. 2012), very little is known about the butterflies of the montane habitats of the southern Western Ghats. Some of the earlier documentation on butterfly fauna from the Western Ghats include—100 species from Silent Valley National Park (Mathew & Rahamathulla 1993), 124 species from Parambikulam Wildlife Sanctuary (Sudheendrakumar et al. 2000), 75 species from Siruvani Reserve Forests (Arun

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# Effect of moisture stress on leaf and root production in cassava (*Manihot esculenta* Crantz.)

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**Abstract**

Field experiments were conducted at the Agronomy farm of College of Horticulture, Vellanikkara during 2015-16 to assess the effect of moisture stress on leaf production and root yield of cassava varieties grown in different seasons. Four varieties (Vellayani Hraswa, Sree Vijaya, M4 and Sree Athulya) of varying duration were planted in three seasons *viz*., May, October and December. The results revealed that the highest leaf production, root weight and chlorophyll content were recorded for the crops planted in May and the lowest in December planted crop. Among the varieties, Sree Athulya, the long duration variety, produced significantly higher number of leaves when planted in October and December, whereas the short duration variety, Sree Vijaya, produced higher number of leaves compared to Vellayani Hraswa for both the planting seasons. Root fresh weight was highest for May planting followed by October and December planting. Among the varieties, Sree Athulya and Sree Vijaya recorded higher leaf retention and were observed to be more drought tolerant when moisture stress occurred during early stages of growth.

**Key words:** Cassava varieties, Chlorophyll, Leaf area index, Leaf scars, Root fresh weight.

## Introduction

Cassava (*Manihot esculenta* Crantz.) is a tropical plant with its distribution almost confined to the tropical zones. It is however not very fastidious or exacting in its climatic requirement. Though a very warm and humid climate is preferred by cassava, when cultivated in the tropics, it is subjected to highly varying temperature, precipitation, photoperiod and solar radiation (Alves, 2002). Cassava as a crop is regarded to be tolerant to sporadic and seasonally extended drought episodes. However, prolonged dry period and extreme environmental fluctuations impose significant yield loss in the crop (Howeler, 1991). Several reports have suggested that the critical period for water deficit in cassava is from the first to the fifth month after planting, i.e., the stage of rapid leaf growth, root initiation and tuberization (Agili and Pardales, 1997; Alves, 2002).

The leaves of cassava plant are borne on long slender petioles, with the first leaves appearing about 10 days after planting (DAP). The leaf takes 15 to 20 days to enlarge completely and remains active for a variable length of time. The photosynthetic process contributes positively to plant growth by 30 DAP, when true leaves begins to expand (Cock et al., 1979). The rate of leaf production and longevity of leaves are the major determinants of leaf area index (LAI), which is associated with yield. Fibrous roots start emerging 15 DAP, replacing the first adventitious roots. Of these, nearly three to 14 fibrous roots become storage roots, which can be distinguished 60 to 90 DAP; they continue to bulk up to harvest.

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Short Communication

# Performance of Kiriyath (*Andrographis paniculata* (Burm.f.) Wall. ex. Nees.) under different shade levels, dates of planting and mulching

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**Abstract**

A field experiment was taken under to study the effect of variations in shade levels, time of planting and mulching on yield and quality of Kiriyath (*Andrographis paniculata).* The treatments consisted of two shade levels (open and 50 per cent shade), four dates of planting (15th May, 15th June, 15th July and 15th August), and three mulching practices (no mulching, paddy straw mulching and black polythene mulching). Higher biomass yield was obtained when planted on 15th May under shade with black polythene mulching (15.67 t $ha^{-1}$). However, it was on par with June planting with black polythene mulch under shaded condition (14.33 t $ha^{-1}$). Andrographolide, the major secondary metabolite responsible for the medicinal property, was higher when planting was in July under shade with paddy straw mulching (1.17%) and was on par with August planting with paddy straw mulching under shade (1.14%).

**Key words:** *Andrographis paniculata*, Black polythene mulch, Dates of planting, Kiriyath, Paddy straw mulch.

Kiriyath (*Andrographis paniculata* (Burm.f.)) Wall. ex. Nees., an important medicinal plant belonging to the family Acanthaceae, is known as "King of Bitters" and is traded in high volume and prioritized by State Medicinal Plant Board, Kerala. It is best suited to hot and humid climatic conditions but during monsoon season it can also be cultivated in subtropical regions. It is one of the foremost broadly utilized plants in ayurvedic medicines and was prescribed in Charaka Samhita dating to 175 BC for treatment of jaundice, besides other plants (Sharma, 1983). It is also used for the treatment of snake bite, diabetes, dysentery, fever and malaria. Variations in environmental conditions have great influence on production of active principles, and it is necessary to identify optimum growing conditions to grow cultivars with high yield potential. However no information is available about the effect of variations in shade levels, time of planting and mulching on yield and quality of Kiriyath (*Andrographis paniculata*).The present experiment was conducted during May - January 2017 at Agronomy farm, Department of Agronomy, College of Horticulture, Vellanikkara. The experimental site was situated at 13° 32'N latitude and 76° 26'E longitude, at an altitude of 40 m above mean sea level. The soil of the experimental site was low in pH (4.65), high in organic carbon (1.13%), low in available N (189 kg $ha^{-1}$) and available P (10.08 kg $ha^{-1}$) and medium in available K (259.84 kg $ha^{-1}$).The experiment was laid out in RBD (factorial), with three replications. The plot size was 3 m x 3 m with a plant spacing of 30 cm x 15 cm. The treatments comprised two shade levels (open and 50 per cent shade), four dates of planting (15th May, 15th June, 15th July and 15th August) and three mulching practices (no mulching, paddy straw mulching and black polythene mulching). Seeds were pre soaked and sown in pro trays filled with coirpith compost and watered. FYM was applied

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