Minor Research Project Summary

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Title of research project: **Ethnomedicobotanical use and antimicrobial review studies of various biofencing plants in the tribal inhabiting areas of Manantavady and Bathery thaluk of Wayanadu District- Kerala**

Submitted to the University Grants Commission

By

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SUMMARY OF THE PROJECT

Ethnomedicobotanical use and antimicrobial review studies of various biofencing plants in the tribal inhabiting areas of Manantavady and Bathery thaluk of Wayanadu District- Kerala

Live fencing is an old and traditional form of agro- forestry that provides a wide range of products and services on farmlands. The International Centre for Research in Agroforestry now World Agroforestry Center defined it as 'A way of establishing a boundary by planting a line of trees and/or shrubs the latter usually from large stem cuttings or stumps, at relatively close spacing and by fixing wires to them. If animals are to be kept in or out, more uprights dead sticks can be tied to the wires.

Besides their primary purpose of controlling human and animal movement, live fences may provide fuel wood, fodder and food, act as wind break or enrich the soil, depending on the species used. Other auxiliary benefits like shade, seed bank, mulch, medicine, nutrient trap, soil and water conservation and wildlife habitat make the use of living fences a more widespread practice.

Villagers also face the threat of grazing, attack by wild animals and entry of human beings. The most pervasive are livestock grazing and off-highway vehicle use. Over the past few decades several areas within this region have been fenced to preclude human disturbance. To overcome these problems the rural people developed unique fencing methods through trial and error method. The village people construct permanent or temporary boundaries around their field or courtyard using different plants. Present study is aimed at the elucidation of different plants used for traditional fencing.

Presence of thorns, spines, prickles, stinging hair and profuse branching make field fences very effective in preventing the entry of both human beings and animals into the cropland. Fences in Wayanadu are once famous for its multy functionality are now progressively getting fragmented due to various socio economic pressure, pushing many species and the associated knowledge in to extinction. So there is an urgent need for the continued conservation of the fencing plants as valuable refugia of diversity and carbon sink. Hence documenting the ethnobotanical information associated with this diversity in the remaining fence patches is a national priority. Keeping this in mind, a study was carried out in the live fencing areas of Bathery and Manamthavady thaluk of Wayanadu district of Kerala a state to understand the floristic attributes of the resident species and also to document their uses and associated ethno botanical information.

This paper documented for the first time traditional live fences of 126 plant species from 86 genera and 43 families along with their botanical name, local name, family, habit, condition, and ethnobotanical usage from the remote, interior, and tribal area of Bathery and Mannthavady areas of Wayanadu district.

All the fencing plants are studied ethnobotanically for the first time from the tribal area. Plants belong to 43 families, of which the Euphorbiaceae are represented by ten species. Fabaceae represented by eight species. Rubiaceae represented by seven species. Acanthaceae, Arecaceae and Rutacea are represented by six species each. Caesalpiniaceae, Apocynaceae and Verbenaceae and Poaceae are represented by five species. Mimosaceae and Malvaceae represented by four species and Agavacea, Pandanaceae by three species each. Zingiberacea, Bombacaceae, Nyctaginaceae, Asclipiadaceae, Cactaceae, Lamiaceae, Annonaceae, Convolvulaceae, Bignoniaceae, Moraceae and Musacea are represented by two species. Oxalidaceae, Artocarpaceae, Asteraceae, Clusiaceae, Casuarinaceae, Boraginaceae, Urticaceae, , Leaceae, Anacardiaceae, Magifereceae, Asparagaceae, Phyllanthaceae, Meliaceae, Passifloraceae

Rhamnaceae, Lythraceae, Oleaceae, solanaceae, sterculiaceae, Myrtaceae and combretaceae etc. are represented by one species each. It is very important to underline that great majority of the plants grow wild.

From the table it is clear that Out of 125 plants 80 are used as both fence and medicine 43 for ornamental purpose 38 leafy vegetables 34 for getting fruits 23 for making wooden items. Fence plants protect crop field from damage by livestock and wild animals and prevented soil erosion by wind.

Some plants which used as dried. Because they provide more compactness, toughness, and protection, from grazing animals and vehicles. Mainly the people live near forest dried bamboo sticks for constructing fence. The dried crown leaves of Areca catechu and Cocos nucifera are also used for fencing. Because their flattened structure provide more protection to the field. Pandanus plant can use in both dried as well as in live condition. They are mainly found in the side of river and stream. They prevent soil erosion, extrem wind. Pandanus are very rarely used now, because anthropogenic activities and the change in climatic conditions make it in an extinct condition. Fence made up of dried bamboo sticks change annually because they degrade if they were not maintained properly.

Instead of fencing properties many of them have certain industrial applications. Polyalthia used for making furniture and also used as wood. *Ananas comosus* have widely use in food items. Lawsonia is used for carpentary works. Tectona grandis plays an important role in timber industry. Bamboo, Areca palm, *Cocos nucifera* etc. are used in craft industry. The dried leaves of Musa is used for making certain craft items. Bamboo is used for making baskets and other items. Coconut husk is used for making different models. These all are highly valuable in society.

To promote proper conservation and sustainable use of biofencing plants, awareness of local communities should be enhanced incorporating the traditional knowledge of scientific findings. The best purpose of having a live fence is that it serves as a shelter belt. This provides shelter for wild animals such as squirrels, rats, mongoose, hares, foxes, and birds such as sparrow, cuckoo, mina, peacock, and wild chicken," These wild animals help the farmer in plant protection by eating the pests on plants and by adding micro nutrients such as calcium, magnesium, nitrogen and phosphorus. Also they help in converting organic and inorganic substances into elements needed for the growth of cultivated and uncultivated plants, according to him.

The investment for either constructing a wall or putting up steel wires is quite heavy. Small and marginal farmers cannot invest a huge sum for erecting such a fence. These plants are also used as fencing plants to protect their agricultural fields. Hence these plants are acting as bio-fencing as well as bio-medicinal plants. All the preparations are very effective, cheap and available around their agricultural fields. So the tribals are using these plants as alternative to allopathic medicines. Further research on these bio-fencing/ bio-medicinal plants on scientific lines may help in developing effective drugs for human health care.

Fencing plants play an important role in Wayanadu in preventing wild animals from entering crop fields. Plants species having spines, thorns, branches are mostly preferred for fencing. Some of these plants are grown around the field permanently as a 'living fence' whereas some are harvested and temporarily placed as a barrier.

The tribes have a well-developed system of traditional fencing. They know about number of rare fencing plants and their applications. But, all this knowledge is gradually lost by some superstitious beliefs of these ethnic groups. They do not reveal the knowledge to others because of the fear that, if they did so, the healing power of the plants may be lost. Even though these

beliefs have certain advantages, a lot of valuable knowledge has been lost by this way. Another problem with tribal knowledge is the absence of recorded data. Numerous ancient knowledge has been lost by the absence of supportive literature. A major reason for this is the illiteracy of the tribes. Further, a large number of fencing plants are being threatened due to deforestation and urbanisation. In these circumstances, ethnobotanical and ethnomedicinal studies have great significance in the collection of traditional knowledge about fencing plants, preparation of recorded data and in the conservation of endangered valuable medicinal plant species. With the help of new technologies, the data could be scientifically proved, so that the scientific world will accept the traditional systems. Nature is providing what we need and our task is to save nature for posterity.

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Dr. C.C. Harilal
Chief Editor

No. EC/13/01/04 **Dated: 11/04/2018**

Sir / Madam

Your article entitled 'Plants related to biofencing and allied uses by Paniya tribe inhabiting areas of Wayanad District, Kerala, India' by Raji, R., Department of Boany, St Marys College, Sulthan Bathery, Kerala, has been accepted for publication in Volume 13, No. 1 (March 2018) issue of Eco Chronicle. This issue will be released in the last week of April 2018.

You are requested to verify the proof of your research article enclosed with this mail and return the same with 10 days of issue of this letter.

Thanking You

Yours Sincerely

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EDITOR
ECO-CHRONICLE

To

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Research Article

Allelopathic Effects of Fencing Plants on Cereals and Pulses

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ABSTRACT

Allelopathic effects of two fencing plants were studied on seed germination and sprouting of seedlings of Local Rice, Scented rice, Zea mays, local gram, mung bean and cowpae. for this study 1% leaf extracts of Vitex negondo and Gliricidia sepium were used. Percent germination as well as seedling growth of test crops was significantly lowered by the aqueous leaf extracts of fencing plants. While on an average Rice, Scented rice, Zea mays and gram were equally sensitive to toxic response. The extract of fencing plants significantly inhibited the seeding growth of Rice, Zea mays, mung bean and cow pea, while the extract was stimulatory to seedling growth of gram.

Key words: Allelopathy, Vitex and Gliricidia.

INTRODUCTION

Although live fencing systems are very old and traditional, the extent of the many potential benefits and the tribal systems are currently not documented. We can learn a lot from tribes who have been using only live fences in their various fields. Wayanadu, being an agrarian district with rich biodiversity, wide ranging agroclimates and in- habited by many indigenous communities experienced in agroforestry, supports a variety of live fence species and systems. Studies on live fence in Wayanadu have been restricted to isolated trials of promising fence species or characterization of species with ability to be used as fence Hegde . However, very little effort has been made to document this unique fencing practice existing in this district.

Allelopathy as a natural phenomenon in plant – plant interaction plays an important role in agroecosystem. Rice (1984) defined allelopathy as ability of one plant to stimulate or inhibit the growth and development of neighbouring plants by secreting secondary compounds in to the environment. Allelopathic effect is a complex and can involve the interaction of different classes of chemicals like phenolic compounds, flavonoids, terpenoids, alkaloids, steroids and amino acids. With mixture of different compound sometimes having a greater allelopathic effect than individual compound these compounds are known as allelochemicals. Yamane (1992) have reported plant residues, leachates and root extracts can be the main source of allelochemicals. The plants selected for present work are Vitex negondo and Gliricidia sepium which are used for fencing the crop field to protect crops from domestic and wild animals. In many parts of Wayanadu fencing plants have been reported by farmers to inhibit seedling growth in field crops and hence this study on allelopathic effect on crop plants was planed. Elakovich and Wooten (1996) state that dried leaf aqueous extract of vitex negondo contain P-29adical29 bezoic acid, P- coumeric acid, furalic acid, vanillic acid, syrengic acid and 10 of flavonoids.

Allelochemicals from *Gliricidia sepium* were extracted, identified, and quantified using HPLC by Ramamoorthy and Paliwal 1993. Fifteen toxic compounds, namely gallic acid, protocatechuic acid,*p*-hydroxybenzoic acid, gentisic acid, *B*-resorcyclic acid, vanillic acid, syringic acid, *p*-coumaric acid, *m*-coumaric acid, *o*-coumaric acid, ferulic acid, sinapinic acid (*trans* and *cis* forms), coumarin, and myricetin were identified and quantified.

The crops selected for the present study are pulse crops – mungbeen (Vigana radiata), cowpea (Vigna unguiculata) local gram (Cicer arietinum).Cereals include

Rice (Oryza sativa), scented rice (Oryza sativa sps) and zea mays. These crops are grown in many parts of Wayanadu and hedged

by the Glyricidia and vitex. These fencing plants remain for many years on crop fields sides and their foliages are continuously add organic matter in soil of field sides hence efforts have been made to study allelopathic effects of fencing plants on crop plants the experiments were conducted to study the effect of aqueous extract of dried leaves of these fencing plants on the germination and seedling vigour of six test crops.

MATERIAL AND METHODS

Allelopathic study of two fencing plants was done on six major crops. To observe effect of leaf exract on germination of seed and seedling growth sheded senescent leaves of fencing plants lantana camera and vitex negundo were collected from the crop field sides. Collected leaves were washed with tap water to remove soil particles and rewashed with distilled water and dried at 60˚ c for 24 hours in ovan. The dried leaves were finely powdered in electric grinder and used for preparation of extract. One gram of powder of senescent leaves of each plant was mixed separately in to 100 ml sterilized distilled water in conical flask and kept for 24 hours. The solutions were then filtered through double layer muslin cloth. The filtrates were used as extract of 1% concentration for allelopathic studies. The extraction was done according to Nelson *et. al* (1960).

Seeds of test crops cereals and pulses were obtained from seed lots of farmers. Seeds of crops were first treated with surface sterilent 0.1% mercuric chloride solution and repeatedly rinsed in distilled water. Sets of 20 seeds each were arranged for each crop. The germination studies were carried out by standered petriplate method. Surface sterilized seeds of test crops were placed in 10cm dia petridishes autoclaved, lined with two filter papers and 5ml extract of each plant was used to moisten the paper in respective petridishes, 5ml distilled water was used to moisten the control set. These petridishes then kept in germinator at normal temperature. After 48 hours incubation observations were made for germination percentage and result were recorded. The emergence of radical was considered as criterion for seed germination. The seedling growth (root and shoot length fresh and dry weight) was recorded after 8 days of sowing. The seedling growth was determined from ten randomly selected seedlings per petridish and their mean values were recorded after measuring root and shoot length and fresh weight their biomass was dried in oven at 60˚c overnight and dry weight was recorded.

RESULTS AND DISCUSSION

The purpose of this study was to evaluate the effect of aqueous extract of vitex and Glyricidia on seed germination and seedling growth of Rice, Scented rice, Zeamays, mungbean and cowpea. To know the allelopathic effect 1 % aqueous leaf extract of each fencing plant and control were used. Percent germination of test crop was significantaly lowered by the aqueous leaf extract of fencing plants while on an average Rice, Scented rice and Zeamays, were equally sensitive to toxic response of fencing plants and cowpea and mungbean germination was stimulated. The extract of vitex negondo significantly inhibited the seeding growth of Rice, Scented rice and Zeamays,, while the extract was stimulatory to seedling growth of cowpea and mungbean The extract was more inhibitory to root length as compared to shoot. In all test crops and dry weight significantaly reduced. The Glyrecidia extract was stimulatory to mungbean seedling only. The extract was more inhibitory to seedling growth of Rice, Scented rice and Zeamays, dry weight of cereals was increased while in pulses dry weight was reduced.

Table 1: Germination percentage of test crop seeds in aqueous leaf extract of Fencing plants

crop	Control	Vitex germination	Glyrecidia germination
Rice	95.00	37.00	55.00
Scented rice	98.00	85.00	86.00
Zea mays	90.00	90.00	76.00
Mung bean	28.00	36.00	46.00
Cowpea	38.00	53.00	46.00
Local gram	38.00	16.00	27.00

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