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PHYTOSOCIALOGICAL ANALYSIS OF WEEDS IN A BAMBOO BASED AGROFORESTRY SYSTEM

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ABSTRACT

The physiological analysis of weeds was carried out during 2000-2001 in bamboo based soybean agroforestry system in Mizoram. The weed flora in the system composed of 21 species belonging to 13 families of which 10 were annuals and 11 were perennials. The species varied greatly with respect to their distribution. The number of weed species was more and their relative densities were higher during the follow period than that during the cropping period. The important value index was highest in Sida acute and was identified as dominant species in the system. The co-dominant species were Bidens pilosa and Gynura auriculata and all these three species together contributed over half of the total weed densities in the systems.

INTRODUCTION

Agroforestry systems are energy subsidies man-made ecosystems which aim at enhancing both agriculture and forest crop yield for the sustenance of mankind. Weeds, the unwanted plants are found to complete more with the crop component than the trees in the system for nutrients space and other resources and trend to suppress the growth of the crop. During the process of struggle for their existence in the ecosystem, they often succeeded owing to their wider ecological amplitude and continue to multiply and flourish even in those environmental conditions where the growth of the crop plant is extremely difficult (Tripathi et.al, 1993, Sahoo, 1998). In north eastern India, intensive studies have been made on various aspects of weeds such as ecological life history, growths and competitive ability, reproductive strategies, allelopathic potential (Tripathi, 1985), dynamics of weed seed banks in soil (Sahoo, 1992) and response of weed seedling population to various environmental constraint operating in the agro ecosystems, however studies related to these aspects are very limited in agroforestry systems.

Agroforestry systems are more complicated than agroecosystems as far as the role of weeds on agricultural crop productions are concerned. For economic reasons and adoption of any weed control management, information on competition and structure of plant communities are essential. The paper presents phytosociaological analysis of weeds in a bamboo based agroforestry system in Mizoram.

MATERIAL AND METHODS

The study was carried out during 2000-2001 in a bamboo based soybean agroforstry system located at Zemabawk Paite Veng (210 32' N and 920 26' E, altitude 900 m msl, average annual rainfall 166-2200 mm, temperature 15.5 C to 29.6 C) about 6 km east of Aizawl the capital city of Mizoram. The field is moderately sloppy (about 45%). The soil of the field is lateristc, silty loam to clay loam and acidic in reaction (pH 5.4). The site belonged to a local farmer who had planted bamboo in the field 3 years ago and had soybean crop in the first year of the field development. However, the field had no agricultural component since the last two years. For the study, soybean crop sowing was made during August 2000.

For the study on phytosocialogical analysis of weed twenty quadrant (size 50 x 50 cm) were laid randomly immediately after the soybean crop sowing. The size and number of quadrants were dertermined accoding to Misra (1968). The weed which emergence I the determined at an interval of 15 days unit crop harvest. Relative density, relative frequency, relative dominance and important value calcualated for each species following the formulae below:

$$\text{Density of a species per unit area} = \frac{\text{Total no. of individual of a species in all sample plots}}{\text{Total no, of sample plots studied}}$$

$$\text{Relative density of a species} = \frac{\text{Total no. of individuals of a species}}{\text{Total no. of individuals of all species}} \times 100$$

$$\text{Frequency} = \frac{\text{Total no. of quadrants in which the species occur}}{\text{Total no. of quadrants studies}} \times 100$$

$$\text{Relative frequency of a species} = \frac{\text{Frequency of the species I stand}}{\text{Sum of the frequency for all species in stand}} \times 100$$

$$\text{Abundance} = \frac{\text{Total number of individual of the species in all quadrants}}{\text{Total number of quadrants in which the species occurred}}$$

$$\text{Relative Dominance} = \frac{\text{Total basal area of the species I all the quadrants}}{\text{Total basal area of the all the species in all the quadrants}} \times 100$$

After the soybean harvest, no further crop was grown in the systems and the field was kept fallow for a period of six month to see the variation in weed composition and their densities between cropping and fallow periods. The weed count was made from the randomly laid 20 quadrants and their analysis was made using the above formulae.

The weeds growing in the field were ranked on the basis of their important value. Co-efficient variation was made on the weed count between quadrants to know the homogeneity in weed distribution across the field.

RESULTS AND DISCUSSION

The weed flora of the agroforestry system composed of twenty-one species belonging to 13 families (table 1), out of which 10 belongs annuals and 11 belongs to parennnials. The weed species composing the flora varied to a great extent with respect to their distribution in different quadrants, the least being 8 species in some quadrant to as high a s 17 in othe quadrants. Similarly, there was a wide variation in the distribution of annuals and perennials between the quadrants. The weeds which were found during the cropping period were also found during the fallow period (Table 1), however the density of weeds were higher during the fallow period than that of corresponding value of cropping period. The ecological analysis of the weed frlora revealed that Sida acuta had the highest density (116.8) followed by Bidens pilosa (70), Cyperus rotundus (26.6), Gynura auriculata (25) and Ageratum conyzoides (24.8).

The data on weed count as revealed from their density and life from in the different quadrants indicated that the field is heterogeneous (Table 2). The composition of weed flora in a particular crop field and its heterogeneity is intricately linked to soil seed bank of the weeds (Sahoo, 1994; Sahoo, 1997),

besides, to the history of the crop fields (Major and Pytt, 1966). The other factors which bring vegetation mosaic in the field could be increasing human interference (Morgan and Neueschwander, 1998; Sahoo, 2001), crop type & rotation, during of the crop exposed to rigorous tilling practices, and to the amount of rainfall a site receives (Misra et al.. 1992 ; Moss, 1998 ; Moore and Wein, and Menges, 1987). The difference in the abundance may be due attributed to intra and intra specific competition as well as to the microclimatic condition within the community which changes markedly with time, growth and expansion of crop canopy (Tripathi et al., 1993).

A higher number of weeds and their relative densities during the fallow period in the present study, obviously was due to the availability of more natural resources for the growth of the weeds on the absence of soybean crop and agricultural disturbances. On the contrary, less weed diversity during the cropping period may be attributed to intense weed-crop competition and/on crop-weed compatibility. The bamboo species growing during this period might have also enhance their growth by taking advantages over the weeds, however, the competition between weed with soybean and /or bamboo considered in this paper.

The importance value was highest I Sida acuta. Thus this species was ranked as the most dominant weed in the agroforestry system (Table 2). The codominance species were Biden pilosa and Gynura auriculata. These three weeds combinedly had over 50 % shares on the weed flora density during the cropping period. Incidentally, except G. auriculata, which is a perennial, using suitable herbicides can easily knock down the othe two troublesome weeds and the crop can be improved for its productivity.

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Table 1. List of weed composition the flora and their peak densities (number m-2) during cropping and fallow perids in the bamboo - soybean agroforestry system.

Name of the weed	Family	List Form	Cropping period	Fellow period
Ageratum conyzoides L.	Asteraceae	A	24.8	30.6
Bidens pilosa L.	Asteraceae	A	70.0	82.4
Centella asiatica L	Apiaceae	P	10.4	24.0
Comelina benghalensis L	Commelinaceae	A	4.8	24.6
Cynadon dactylon L	Poaceae	P	15.4	18.4
Cyperus iria Roxb.	Cyperaceae	P	12.2	16.6
Cyperus rotundus Roxb.	Cyperaceae	P	26.0	37.0
Desmodium heterophyllum D.C.	Papilioneaceae	P	3.6	11.2
Digitaria ciliaris (HBR) Hern.	Poaceae	A	9.8	118.6
Drymaria cordata L.	Caryophyllaceae	A	13.2	27.6
Eclipata alba L.	Asteraceae	A	3.8	13.2
Eupatorium odorantum L	Asteraceae	P	7.0	13.6
Galinsoga ciliate (Rafin)	Asteraceae	A	16.4	53.2
Gynura auriculata L	Asteraceae	P	25.0	23.6
Imperata cylindrical (Beauv)	Poeceae	P	6.6	105.6
Lantana camara L.	Verbenaceae	A	9.0	23.6
Mikenia scandense L.	Asteraceae	P	3.0	5.8
Oxalis corniculata L.	Oxalidaceae	P	9.2	15.2
Rubia spp.	Rosaceae	A	22.4	37.8
Setaria glauca Beauv.	Poaceae	P	6.2	16.6
Sida acuta L	Malvaceae	A	116.8	104.4
A - Annuals, P- Perenials			415.6	803.6

Table 2. Floristic composition and importance value index (IVI) of weds in the bamboo based soybean agroforestry system

Name of the weed	Relative Density(%)	Relative frequency(%)	Relative dominance(%)	IVI Rank	Species
A. conyaoides	5.92	6.89	5.23	18.04	(5)
B. pilosa	16.72	4.47	1.13	22.58	(2)
C. asiatica	2.48	5.60	5.23	13.31	(10)
C. benghalensis	1.14	3.44	7.42	12.00	(13)
C. dactylon	3.67	6.03	8.72	18.42	(4)
C. iria	2.91	4.47	0.43	8.08	(20)
C. rotundus1	6.35	5.60	3.14	15.09	(8)
D. heterophyllum	0.86	3.87	3.49	8.22	(18)
D. ciliaris	2.34	4.31	2.61	9.26	(16)
D. cordatai	3.15	3.87	2.18	9.20	(21)
E. alba	0.90	6.03	0.41	7.36	(21)
E. odoratum	1.67	3.87	4.80	10.34	(14)
G. ciliate	4.01	4.77	6.54	15.26	(7)
G. auriculata	5.97	3.44	9.16	18.57	(3)
I. cylindrical	1.56	3.44	7.85	12.86	(12)
L. camara	2.63	4.74	8.29	15.65	(6)
M. scandense	0.71	3.87	4.36	8.94	(17)
O. corniculata	2.19	5.60	5.23	13.02	(17)
Rubia spp.	5.60	5.60	2.18	13.38	(9)
S. glauca	1.48	5.60	1.52	8.60	(19)
S. acuta	27.90	3.87	9.60	41.37	(1)