Diversity of weed flora in pineapple plantations of Kerala

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ABSTRACT

Pineapple is an important foreign exchange crop of Kerala. A study was initiated to survey the pineapple growing areas and identify the weed flora, their habitat preferences and growth habits is a pre-requisite for developing an appropriate weed management strategy. A survey was undertaken in five major pineapple producing districts of Kerala and phytosociological parameters were estimated.. The results showed the occurrence of a fairly wide diversity of weeds in pineapple plantations (54 species), with species from 25 families present in almost all the areas surveyed. The highest representation of weeds was observed from the family Asteraceae (10), followed by Poaceae (8) and Fabaceae (5).Highest frequency values were obtained for Mikania micrantha (63), Chromolaena odorata (60), Merremia umbellata (53.3), Mimosa pudica (50), Alternanthera bettzickiana (50), Cyclea peltata (46.6), Centrosema pubescens (43.3), Cleome burmanii (46.6), Commelina diffusa (43.3), and IchInocarpus frutescens (43.3). Mikania micrantha, Chromolaena odorata, Merremia umbellata, Mimosa pudica, Alternanthera bettzickiana, Cyclea peltata, Cleome burmanii, Centrosema pubescens, and Ichinocarpus frutescens. had the highest Relative dominance while Abundance value was higher for Isachne miliacea, Cynodon dactylon, Digitaria ciliaris, Mollugo verticillata, Parthenium hysterophorus, Melochia corchorifolia, Bulbostylis barbata and Cyperus iria.

Keywords **:** *Abundance, frequency, pineapple, relative frequency and weed flora*

Pineapple (*Ananus comosus*) is a member of the family Bromeliaceae, which consists chiefly of epiphytic herbs and small shrubs. Popular for its sweet juicy multiple fruit, pineapple is grown throughout the warmer regions of the world. It is an introduced crop in India and is grown exclusively as a managed commercial crop. India is the sixth largest producer of pineapple in the world with a share of about 8 per cent in production (Joy, 2013). Pineapple is cultivated in an area of 10200 ha in Kerala, with a production of 85500 t and a productivity of 8.4 tons per hectare (National Horticulture Board, 2011). In Kerala, pineapple is grown mainly as an intercrop in rubber and coconut, and also as pure crop in garden land and in converted paddy fields. The humid climate is congenial for its growth and the pineapple fruits of Kerala are renowned for their quality, sweetness and flavour and are in great demand in India and foreign countries.

In Kerala, pineapple is an important foreign exchange earning crop and Vazhakulam in Ernakulam district of Kerala produces the best quality table fruits. GI registration is expected for Vazhakulam pineapple (GI) No. 130 under Agricultural-Horticultural product at the GI Registry. This will endorse brand protection under WTO guidelines to the producers (Joy, 2013).

Planting of pineapple is done throughout the year, except in the days of heavy monsoon. Planting is done in trenches of about 90 cm width and 15-30 cm depth, aligned at a distance of 165 cm from centre to centre (KAU, 2016). The bare spaces between trenches and the high rainfall, which is a characteristic of the state,

promote the abundant growth of weeds. Weeds are a major constraint in crop production and also a cause for escalation of cost of production. They also serve as alternate hosts for the pineapple mealy bug (*Dysmicoccus brevipes*) and ants (Sulaiman, 1997; Tachie-Menson, 2014), which transmit pineapple wilt, and hence their control is of prime importance.

Black plastic mulching is a worldwide practice in pineapple cultivation for weed control. In the absence of mulching, pre-emergence herbicides are sprayed in the areas between trenches with subsequent growth managed by spraying post-emergence herbicides. Intercropping with legumes is another common practice for suppressing vegetation in the interspaces of pineapple. Identification of the major weed species, their habitat preferences and growth habits is a pre-requisite for developing an appropriate weed management strategy. With the objective of identifying the dominant weed species, a survey was undertaken in five major pineapple producing districts of Kerala.

The study was undertaken in 30 pineapple plantations from important pineapple growing districts of the state *viz.*, Kottayam, Idukki, Ernakulam, Thrissur and Palakkad. Selected farms were divided into different blocks based on the area and all the weeds present were identified. Their distribution was then presented on the scale of the whole farm. The field tour method was used for the survey. It is a flora survey technique which involves identification of the different species of the field (Chicouene, 2000; Kouame *et al*., 2011). It consists of going through the field in many directions to find any

new species. Quadrates of 1 m^2 were randomly placed in each location under study and average counts of different weeds were worked out. The phytosociological

indices *viz*., frequency, relative frequency and abundance value were estimated using the following formulae:

$$\text{Frequency (\%)} = \frac{\text{No. of quadrates in which a species occurred}}{\text{Total number of quadrates taken}}$$

$$\text{Relative frequency} = \frac{\text{No. of occurrences of a species}}{\text{Total occurrences of all species}} \times 100$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all the quadrates}}{\text{Total no. of quadrates in which the species occurred}}$$

The results of the study showed that the major weeds of pineapple can be categorized into four groups, climbers (7), monocots (6), dicots (28) and sedges (4) (Table 1). The composition of the weed flora did not differ drastically and ecologically from one plot to another for the plantations of the same age. According to McDonald *et al*. (2009), weed interference in annual cropping systems can be highly variable from year-to-year and spatially heterogeneous, and also depends on the rainfall pattern of the region. However on estimation of the phytosociological indices such as frequency, relative frequency and abundance, characteristic variations were observed in the species composition.
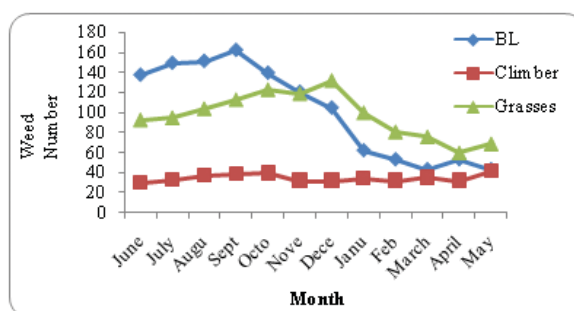

Fig. 1: Seasonal influence on weed diversity in pineapple gardens

The results show the occurrence of a fairly wide diversity of weeds in pineapple plantations, with species from 25 families present in almost all the areas surveyed. The highest representation of weeds was observed from the family Asteraceae (10), followed by Poaceae (8) and Fabaceae (5).

Frequency generally refers to the degree of uniformity of occurrence or dispersion of a species in an area and represents the number of sampling units in which that particular species occurred. In pineapple, highest frequency values were obtained for *Mikania micrantha* (63), *Chromolaena odorata* (60), *Merremia umbellata* (53.3), *Mimosa pudica* (50), *Alternanthera bettzickiana* (50), *Cyclea peltata* (46.6), *Centrosema pubescens* (43.3), *Cleome burmanii* (46.6), *Commelina diffusa* (43.3)*, and IchInocarpus frutescens* (43.3). The higher frequency values reflect the greater uniformity and spread of these species. Out of these ten weed species, five were climbers and the others were fast growing invasive species commonly found on disturbed soils. Climbers were thus, a major problem in pineapple cultivation.

According to Mishra (1966), relative frequency compares the ecological importance of individual species in a plant community. In the current study the highest values were obtained for *M. micrantha, C. odorata, M. umbellata, M. pudica, A. bettzickiana, C. peltata, C. burmanii, C. pubescens,* and *I. frutescens.*

Abundance is useful in determining the dominance of a species in an ecosystem. High value for abundance indicates that in places where the species was present it may have been the dominating one, but it need not have been uniformly present in all the places. Hence the frequency and relative frequency values for these species are much lower. The dominance of such species depends on the physiochemical properties of the soil, availability of water and the climatic features of the region. These species include *I. miliacea, C. dactylon, D. ciliaris, M. verticillata, P. hysterophorus, M. corchorifolia, B. barbata* and *C. iria.*

However there seems to be a seasonal influence on weed diversity in the pineapple fields The population of broad leaved weeds is seen from June-July to December. Grasses dominate from August to December. The population of climbers is almost uniform throughout the growing period.

Table 1: Phytosociological indices of weeds species growing in pineapple plantations

Sl. No.	Species	Family	Frequency (%)	Abundance	Relative frequency (%)
1.	*Acyranthes aspera*	Amaranthaceae	20.00	9.16	11.00
2.	*Ageratum conyzoides*	Asteraceae	36.60	5.00	20.00
3.	*Alternanthera bettzickiana*	Amaranthaceae	50.00	3.66	27.20
4.	*Amarathus sp.*	Amaranthaceae	6.60	27.50	3.60
5.	*Biophytum sensitivum*	Oxalidaceae	10.00	18.30	5.40
6.	*Borreria latifolia*	Rubiaceae	36.60	5.00	20.00
7.	*Brachiaria distachya*	Poaceae	30.00	6.11	16.36
8.	*Bulbostylis barbata*	Cyperaceae	3.30	55.00	1.80
9.	*Calopogonium mucunoides*	Fabaceae	13.30	13.75	7.20
10.	*Centrosema pubescens*	Fabaceae	43.30	4.23	23.60
11.	*Chromalaena odorata*	Asteraceae	60.00	3.05	32.70
12.	*Cleome burmanii*	Capparaceae	46.60	3.92	25.45
13.	*Clerodendron infortunatum*	Verbenaceae	26.60	6.80	14.54
14.	*Colocasia esculenta*	Araceae	20.00	9.16	10.90
15.	*Commelina diffusa*	Commelinaceae	43.30	4.23	23.63
16.	*Crassocephalum crepidioides*	Asteraceae	10.00	18.33	5.40
17.	*Cyclea peltata*	Menispermaceae	46.60	3.93	25.50
18.	*Cynodon dactylon*	Poaceae	3.30	55.00	1.80
19.	*Cyperus iria*	Cyperaceae	3.30	55.00	1.80
20.	*Cyperus rotundus*	Cyperaceae	16.70	11.00	9.09
21.	*Dactyloctenium aegyptium*	Poaceae	26.60	6.87	14.50
22.	*Digitaria ciliaris*	Poaceae	3.30	55.00	1.80
23.	*Emilia sonchifolia*	Asteraceae	23.30	7.85	12.70
24.	*Euphorbia hirta*	Euphorbiaceae	33.30	5.50	18.18
25.	*Hemidesmus indicus*	Asclepiadaceae	30.00	6.11	16.36
26.	*Hyptis suaveolens*	Lamiaceae	6.60	27.50	3.60
27.	*IchInocarpus frutescens*	Apocynaceae	43.30	4.23	23.63
28.	*Isachne miliacea*	Poaceae	3.30	55.00	1.80
29.	*Ischaemum indicum*	Poaceae	20.00	9.16	10.90
30.	*Leucas aspera*	Lamiaceae	10.00	18.33	5.45
31.	*Ludwigia parviflora*	Onagraceae	16.70	11.00	9.09
32.	*Melochia corchorifolia*	Sterculiaceae	3.30	55.00	1.80
33.	*Merremia umbellata*	Convolvulaceae	53.30	3.43	29.09
34.	*Merremia vitifolia*	Convolvulaceae	13.30	13.75	7.27
35.	*Mikania micrantha*	Asteraceae	63.30	2.89	34.54
36.	*Mimosa invisa*	Fabaceae	6.60	27.50	3.63
37.	*Mimosa pudica*	Fabaceae	50.00	3.60	27.27
38.	*Mitracarpus verticillatus*	Rubiaceae	23.30	7.85	12.70
39.	*Mollugo verticillata*	Molluginaceae	3.30	55.00	1.80
40.	*Parthenium hysterophorus*	Asteraceae	3.30	55.00	1.80
41.	*Paspalam conjugatum*	Poaceae	13.30	13.75	7.27
42.	*Pennisetum pedicellatum*	Poaceae	13.30	13.75	7.20
43.	*Peperomia pellucida*	Piperaceae	13.30	13.75	7.20
44.	*Phyllanthus niruri*	Phyllanthaceae	30.00	6.11	16.36
45.	*Phyllanthus urinaria*	Phyllanthaceae	26.70	6.87	14.55
46.	*Physalis minima*	Solanaceae	3.30	55.00	1.80
47.	*Ruellia prostrata*	Acanthaceae	33.30	5.50	18.18
48.	*Scoparia dulcis*	Scrophulariaceae	23.30	7.85	12.70
49.	*Sebestiana chamaelea*	Euphorbiaceae	13.30	13.75	7.27
50.	*Sida rhombifolia*	Fabaceae	6.60	27.50	3.60
51.	*Spilanthes calva*	Asteraceae	20.00	9.16	11.00
52.	*Synedrella nodiflora*	Asteraceae	40.00	4.58	21.80
53.	*Tridax procumbens*	Asteraceae	30.00	6.11	16.36
54.	*Vernonia cinerea*	Asteraceae	36.60	5.00	20.00

REFERENCES

Chicouene, D. 2000. Methods for assessing the weed population within a field: ii. streamlined procedures. Phytoma-La Défense des Végétaux, **524 :** 18-23.

Joy, P.P. 2013. *Pineapple sector in Kerala: Status, opportunities, challenges and stakeholders.* Pineapple Research Station (Kerala Agricultural University), Vazhakulam-686670, Muvattupuzha, Ernakulam, Kerala, pp. 1-8.

KAU. 2016. *Package of Practices and Recommendations for Crops*. Directorate of Extension, Kerala Agricultural University, Thrissur, Kerala, India, pp. 223.

Kouame, K.F., Ipou Ipou, J., Toure, A. and N'Guessan, K.E. 2011. Major weeds of rice agro-ecosystems in Côte d'Ivoire. *Agric. Biol. J. N. America*, **2**: 1317-25.

McDonald, A.J., Riha, S.J., DiTommaso, A. and DeGaetano, A. 2009. Climate change and the geography of weed damage: analysis of US maize systems suggests the potential for significant range transformations. *Agric. Ecosyst. Env*., **130** : 131-40.

Misra, R. 1966. *Ecology Work Book.* Oxford & IBH, Calcutta.

Sulaiman, S. F. M. 1997. Impact of weed management on ant density and fruit yield in the control of pineapple wilt disease. *Acta Hort.,* **425** : 475-84.

Tachie-Menson, J.W., Sarkodie-Addo, J. and Carlson, A.G. 2014. Effects of weed management on the prevalence of pink pineapple mealy bugs in Ghana. *J. Sci. Tech.,* **34** : 17-25.