www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(10): 1480-1483

www.thepharmajournal.com
Received: 01-08-2021
Accepted: 03-09-2021

M Nandhini
Department of Vegetable Science, Horticulture College and Research Institute, Coimbatore, Tamil Nadu, India

H Usha Nandhini Devi
Department of Vegetable Science, Horticulture College and Research Institute, Coimbatore, Tamil Nadu, India

L Pugalendhi
Dean Horticulture, Horticulture College and Research Institute, Coimbatore, Tamil Nadu, India

P Murali Arthanari
Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Corresponding Author:
M Nandhini
Department of Vegetable Science, Horticulture College and Research Institute, Coimbatore, Tamil Nadu, India

Performance evaluation of sweet potato (*Ipomoea batatus* L.) as weed smothering under coconut ecosystem

M Nandhini, H Usha Nandhini Devi, L Pugalendhi and P Murali Arthanari

Abstract
A field experiment was conducted to assess the interference and suppression of sweet potato genotypes on the weed population in the coconut ecosystem as a cover crop in the basin of the tree. The study was conducted in the College Orchard, Coconut Farm, Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during the period 2020-2021 in Randomized block design with seven treatments (60 DAP (CO 5); 90 DAP (CO 5); 120 DAP (CO 5); 60 DAP (IB 74); 90 DAP (IB 74); 120 DAP (IB 74); Control) replicated thrice. Two sweet potato genotypes CO 5 and IB 74 were used in the experiment. Observations on weed flora identification, weed count (number/m^2), weed dry weight (g/m^2) and weed control efficiency (%) in coconut ecosystem were recorded. It was observed that broad leaved weeds were found more than the grasses and sedges in coconut ecosystem. The lowest weed density (4.02 no/m^2), weed dry weight (3.11 g/m^2) and the highest weed control efficiency (44.47%) were recorded in the CO 5 at 120 days after planting.

Keywords: cover crop, sweet potato, weed density, weed control efficiency, weed dry weight

Introduction
Coconut is one of the important plantation crops grown in India. In India major states growing coconut are Kerala, Karnataka and Tamil Nadu and the productivity is high in Tamil Nadu. It shares about 25.03% of Total production of coconut (NHB, 2018). Major coconut producing districts are Thiruppur, Kanyakumari, Coimbatore and Thanjavur (Kannan *et al.*, 2017; Kalimuthu and Raghavi, 2019) [7, 6]. Approximately 75% of land remains unutilized due to wider spacing in coconut and it permits 40 to 60% of sunlight (Neduncheziyan*et al.*, 2007) [12] and the availability of sunlight in the interspaces favoured weed growth and reduced the yield of coconut by reducing the nutrient uptake and soil moisture (Senarathne and Gunathilake, 2010) [18]. Weed control and management is one of the major problems in coconut ecosystem. Weeds in coconut garden are managed in different ways *viz.*, grazing, mechanical, chemical, intercrop, cover crop and integrated weed management.
Sweet potato (*Ipomoea batatus* Lam.) is a versatile food crop of tropics and sub-tropics principally for its roots (Rethinam, 2001) [16]. It is a dicotyledonous plant which belongs to the family convolvulaceae and native of Central and South America. It has approximately 50 genera and more than 1000 families among which only *Ipomoea batatus* is of major economic importance as a food crop. It is popularly known as 'Sakarkand' all over India. Sweet potato is otherwise called as 'Irish potato' or 'White potato' or 'Morning glory'. Among the root and tuber crops grown in the world, sweet potato ranks second after cassava (Nedunchezhiyan *et al.*, 2012) [13]. Major Sweet potato growing state in India is Odisha (Prakash *et al.*, 2018) [15].
Sweet potato is a herbaceous perennial plant, however it is cultivated as an annual vine and propagated by vine cuttings. Its growth habit is predominately prostrate with a vine system that rapidly expands horizontally on the ground and dense canopy structure which covers the surface quickly as a ground cover (Kuhlase *et al.*, 2009) [10].
It is a rich source of protein, carbohydrate, sugar and vitamin A. It produces high yield per unit area per unit time even in marginal lands. It has great flexibility for integration in cropping systems. It has relatively low need for inputs during initial growth stages and is a highly attractive crop for sustainable agricultural development in many places in both developed and developing countries.

The root and foliage yield is more per unit area as compared to other root crops (Sankari *et al*, 2019) [17]. Sweet potato is valued as a source of human food, animal feed and industrial raw material.

Sweet potato is used as cover crop (Aladesanwa and Adigun, 2008; Islam *et al*., 2015) [1, 5] in the unutilized land for suppression of weeds. It has dense canopy structure when it reaches maximum growth which inhibits weed germination and suppresses the growth and development of weeds. Sweet potato vine has its creeping and prostrate behaviour which suppresses the photosynthetic activity and controls weed population. This method of weed control was economic, eco-friendly and cost effective (Okwor *et al.*, 1994). The present study was carried out to evaluate the influence of sweet potato genotypes as a cover crop in coconut ecosystem on weed management.

2. Materials and Methods

An experiment was conducted in the College Orchard, Coconut Farm, Department of Spices and Plantation Crops, HC&RI, TNAU, Coimbatore during the period 2020-2021. The experimental plot consisted of sandy clay loam soil with pH value of 8.4, available Nitrogen 252 kg/ha, available Phosphorous 23 kg/ha and available Potassium 168 kg/ha. The experimental field consisted of coconut trees spaced at 7.5×7.5 m and age of the coconut palm was 30 years. Identification of weed flora species on experimental plot was done before field preparation. Major weed species identified in the experimental plot was broad leaved weeds followed by grasses. The experimental field was ploughed finely and basin was formed around the coconut palm after the weed species were recorded. Two genotypes CO 5 and IB 74 were used in this study. Sweet potato was planted at 30×20 cm spacing with 15-20 cm long vine cuttings in the coconut basin as a cover crop. The experiment was conducted in randomized block design (RBD) with seven treatments, T_1 -60 DAP (CO 5); T_2 -90 DAP (CO 5); T_3 -120 DAP (CO 5); T_4 -60 DAP (IB 74); T_5 -90 DAP (IB 74); T_6 -120 DAP (IB 74); T_7 –control and replicated thrice and each treatment consisted of one coconut plant. Sweet potato genotype vines were harvested at three different intervals at 60, 90 and 120 days after planting.

Weed samples were taken randomly at 60, 90 and 120 days after planting from three places using a quadrate of 0.25 m^2 and calculated the weed population/ m^2. Then weeds collected randomly by using quadrate were air dried followed by drying in hot air oven at 80 °C for obtaining constant dry weight and expressed as g/m^2. There after weed control efficiency was calculated as per the procedure given by Mani *et al.* (1973) [11]. It was worked out based on dry matter of weed population in control plot compared with weed population in treatment plot and expressed in percent. Standard package of practices were followed for analysis of data. The data observed was subjected to analysis of variance (ANOVA) using AGRES software suggested by Gomez and Gomez, 1984 [4]. The observed data on weed density, and weed dry weight were subjected to square root transformation ($\sqrt{x+0.5}$). Weed control efficiency was calculated using the formula,

$$\text{WCE}\ (\%) = \frac{\text{DW}_{pc} - \text{DW}_{pt}}{\text{DW}_{pc}} \text{ X } 100 \quad (1)$$

Where,

DW_{pc} – weed dry weight in control plot

DW_{pt} – weed dry weight in treatment plot

3. Result and Discussion

Observations were recorded on the weed flora. A total of 21 weed species were identified in the experimental field. Among all the categories, broad leaved weeds were dominated followed by grasses and sedges. The predominant weed flora observed in the experimental field was *Parthenium hysterophorus, Trianthema portulacastrum, Cynodon dactylon and Cyperus rotundus.* The weed flora found in the experimental field is listed in Table 1. A higher number of weed species was observed which might be due to availability of more sunlight in the coconut garden and resource rich soils. Similar results were reported by Karmegam, (2016) [9], Gangaiah, (2019) [3] and Sit *et al.* (2007) [19].

The weed density and weed dry weight recorded in the treatment plot per m^2at 60, 90 and 120 DAP. The data showed that various treatments significantly influenced the weed density given in the Table 2. The lowest weed density (4.02) was recorded in CO 5 at 120 days after planting (T_3) followed by (4.91) IB 74 at 120 days after planting (T_6) and highest weed density was recorded in the control (7.23) followed by (6.73) IB 74 at 60 days after planting (T_4) and (6.20) CO 5 at 60 days after planting (T_1). The data revealed that the genotype CO 5 at 120 days after planting recorded the lowest weed density among all the treatments. This might be due to its dense canopy, quick growing and spreading habit which reduces the germination of weed and suppresses the photosynthetic activity of weeds. Similar results was observed in cassava intercrop with sweet potato which suppressed the weeds and significantly reduced the weed density (Arukwe Udodirioha and Friday, 2020) [2] and sweet potato intercropped with coffee (Kanua, 1997) [8].

The weed dry weight was significantly influenced by the treatments. The data showed that various treatments given in the Table 3. The value of weed dry weight was similar to weed density. The lowest weed dry weight (3.11) was recorded in the CO 5 at 120 days after planting (T_3) followed by IB 74 at 120 days after planting T_6 (3.54). The highest weed dry weight was recorded in the control (5.60) followed by IB 74 at 60 days after planting (T_4) (5.15).Because of least weed density in CO 5 at 120 days after planting (T_3) weed dry weight was also reduced in CO 5 at 120 days after planting (T_3). This might be due to the influence of sweet potato smothering ability and as a result the weeds are not able to accumulate more biomass.

The weed control efficiency was worked out and it was found varying with different harvest interval of sweet potato at various growth stages and data given in the Table.3. The weed control efficiency was taken in different crop growth stages *viz.*, 60, 90 and 120 DAP. The highest weed control efficiency (44.47) was recorded in the CO 5 at 120 days after planting (T_3) followed by IB 74 at 120 days after planting (T_6) (36.79) and then lowest weed control efficiency (8.04) was recorded in IB 74 at 60 days after planting (T_4) followed by CO 5 at 60 days after planting (T_1) (15.00). The outcome of the weed control efficiency was closely associated with weed dry weight. The genotype CO 5 at 120 days after planting recorded the lowest weed dry and highest weed control efficiency.

From this experiment, it was found that sweet potato genotype CO 5 at 120 DAP recorded the highest weed control efficiency in the experimental field in coconut ecosystem in the tree basin as cover crop. CO 5 Sweet potato genotypes at

120 DAP quickly covers the exposed surface of the soil and it suppresses most of the weed flora when grown closely by reducing availability of light and physical interference. From this study, it can be concluded that sweet potato CO 5 genotype at 120 days planting has ability to smother the weeds effectively in the coconut garden.

Table 1: Weed flora recorded in the experimental plot with their family and local name/common name.

S. No.	Botanical name	Family	Local name/common name
A	Broad leaved weeds		
1.	*Abutilon indicum* L.	Malvaceae	Thuthi
2.	*Acalypha indica* L.	Euphorbiaceae	Kuppaimeni
3.	*Achyranthes aspera* L.	Amaranthaceae	Naayuruvi
4.	*Aerva lanata* (L.) Juss.	Amaranthaceae	Sirukanpeelai
5.	*Amaranthus tristis* Roxb.	Amaranthaceae	Thandangeerai
6.	*Boerhavia diffusa* L.	Nyctanginaceae	Padarmookirattai
7.	*Boerhavia erecta* L.	Nyctanginaceae	Mookirattai
8.	*Euphorbia geniculata*	Euphorbiaceae	Milk weed
9.	*Euphorbia hirta* L.	Euphorbiaceae	Ammaanpacharisi
10.	*Leucas aspera* (Willd) Link.	Lamiaceae	Thumbai
11.	*Mimosa pudica* L.	Mimosaceae	Thottaalsurungi
12.	*Phyllanthus amarus* Schum and Thom.	Euphorbiaceae	Keelaanelli
13.	*Physalis minima* L.	Solanaceae	Sodakkuthakkaali
14.	*Portulaca oleracea* L.	Portulacaceae	Paruppukkeerai
15.	*Ruellia prostrate*	Acanthaceae	Bell weed
16.	*Tridax procumbens* L.	Asteraceae	*Tridax* daisy
17.	*Vernonia cinerea* L.	Asteraceae	Little iron weed

Table 2: Effect of sweet potato on weed density of different weed flora

Treatments	Grasses (No./m^2)	Sedges (No./m^2)	Broad leaved weeds (No./m^2)	Total weed density (No./m^2)
T_1- 60 DAP (CO 5)	(3.20) 9.30	(2.66) 6.10	(4.81) 22.10	(6.20) 37.50
T_2- 90 DAP (CO 5)	(3.00) 8.00	(2.28) 4.20	(3.82) 13.60	(5.18) 25.80
T_3-120 DAP (CO 5)	(2.24) 4.00	(2.02) 3.10	(3.01) 8.10	(4.02) 15.20
T_4 - 60 DAP (IB 74)	(3.65) 12.30	(2.72) 6.41	(5.16) 25.62	(6.73) 44.30
T_5- 90 DAP (IB 74)	(3.15) 8.90	(2.64) 5.95	(4.54) 19.65	(5.95) 34.50
T_6 - 120 DAP (IB 74)	(2.83) 7.00	(2.11) 3.47	(3.71) 12.73	(4.91) 23.20
T_7 - Control	(3.71) 12.75	(3.26) 9.60	(5.47) 28.95	(7.23) 50.5
C.D.	0.09	0.08	0.14	0.15
SE(d)	0.04	0.03	0.07	0.07

Note: Data in parenthesis (transformed value) was subjected to ($\sqrt{x}$+0.5) transformation

Table 3: Effect of sweet potato on weed dry weight and weed control efficiency of different weed flora

Treatments	Grasses (g/m^2)	Sedges (g/m^2)	Broad leaved weeds (g/m^2)	Total weed dry weight (g/m^2)	Total weed control efficiency (%)
T_1 - 60 DAP (CO 5)	(2.67) 6.10	(2.23) 3.95	(3.56) 11.65	(4.76) 21.70	15.00
T_2 - 90 DAP (CO 5)	(2.30) 4.30	(1.98) 2.90	(2.74) 6.50	(3.83) 13.70	31.61
T_3 -120 DAP (CO 5)	(1.88) 2.55	(1.69) 1.86	(2.29) 4.25	(3.11) 8.66	44.47
T_4 - 60 DAP (IB 74)	(2.94) 7.62	(2.29) 4.25	(5.15) 13.68	(5.15) 25.55	8.04
T_5 - 90 DAP (IB 74)	(2.37) 4.60	(2.06) 3.25	(3.26) 9.65	(4.30) 17.50	23.21
T_6 - 120 DAP (IB 74)	(2.13) 3.55	(1.73) 2.00	(2.64) 5.95	(3.54) 11.50	36.79
T_7 – Control	(3.03) 8.15	(2.55) 5.48	(4.21) 16.75	(5.60) 30.38	0.00
C.D.	0.06	0.07	0.11	0.20	
SE(d)	0.03	0.03	0.05	0.09	

Note: Data in parenthesis (transformed value) was subjected to ($\sqrt{x}$+0.5) transformation

4. References

1. Aladesanwa RD, Adigun AW. Evaluation of sweet potato (*Ipomoea batatas*) live mulch at different spacings for weed suppression and yield response of maize (*Zea mays* L.) in south western Nigeria. Crop Protection 2008;27(6):968-975.
2. Arukwe Udodirioha E, Friday E. Effect of cassava-sweet potato intercrops patterns and weed control methods on weed suppression 2020.
3. Gangaiah B. Weed management in arecanut (*Areca catechu* L) plantation during post rainy season through herbicides in Andaman and Nicobar Islands. Journal of Crop and Weed 2019;15(2):148-154.
4. Gomez KA, Gomez AA. Statistical procedures for agricultural research. John Wiley and Sons 1984.
5. Islam MN, Akhteruzzaman M, Alom MS, Salim M. Hybrid maize and sweet potato intercropping: a technology to increase productivity and profitability for poor hill farmers in Bangladesh. Saarc Journal of Agriculture 2014;12(2):101-111.
6. Kalimuthu K, Raghavi MD. Review on area, production and productivity of coconut in India. International Journal of Research in Business Management 2019;7(1):1-6.
7. Kannan B, Ragunath KP, Kumaraperumal R, Jagadeeswaran R, Krishnan R. Mapping of coconut growing areas in Tamil Nadu, India using remote sensing and GIS. Journal of Applied and Natural Science 2017;9(2):771-773.
8. Kanua MB. Intercropping effect of sweet potato on the growth, development and yield of arabica coffee grown at Aiyura, Papua-New-Guinea. In Colloque Scientifique International Café 1997,17.
9. Karmegam N. Floral Diversity of Vaigai River in Thiruppuvanam Region of Sivagangai District, Tamil Nadu, Southern India. International Journal of current research in biosciences and plant biology 2016;3(2):96-105.
10. Kuhlase LM, Ossom EM, Rhykerd RL. Effects of plant populations on morphological and physiological parameters of intercropped sweet potato *(Ipomoea batatas* L.) and groundnut (*Arachis hypogaea* L.). Academic Journal of Plant Science 2009;2(1):16-24.
11. Mani VS, Gautam KC, Chakraborthy. Losses in crop yield due to weed growth. PANS 1973;14:142-158.
12. Nedunchezhiyan M, Byju G, Naskar SK. Sweet potato (*Ipomoea batatas* L.) as an intercrop in a coconut plantation: growth, yield and quality. Journal of Root Crops 2007;33(1):26-29.
13. Nedunchezhiyan M, Jata SK, Byju G. Sweet potato-based cropping systems. Fruit, vegetable and cereal science biotechonology 2012;6:11-16.
14. Orkwor GC, Okereke OU, Ezedinma FOC, Hahn SK, Ezumah HC, Akobundu IO. The response of yam (*Dioscorea rotundata* Poir.) to various periods of weed interference in an intercropping with maize (*Zea mays* L.), Okra (*Abelmoschus esculentus* L. Moench), and sweet potato (*Ipomoea batatas* L.). In Symposium on Tropical Root Crops in a Developping Economy 1991;380:349-354.
15. Prakash P, Kishore P, Jaganathan D, Immanual S, Sivakumar PS. The Status, Performance and Impact of sweet potato cultivation on farming communities of Odisha, India. In 30th International conference of Agricultural Economist 2018.
16. Rethinam P. Research output and farmers adoption of technology on coconut based farming system-The Indian experience. Indian coconut Journal cochin 2001;32(4):3-11.
17. Sankari AM, Anand Kayalvizhi K, Kannan M. Evaluation of sweet potato (*Ipomoea batatas* (L) Lam.) clones for root yield and processing qualities. Journal of Pharmacognosy and Phytochemistry 2019;8(2):322-325.
18. Senarathne SHS, Gunathilake HAJ. Weed management in mature coconut plantations in Sri Lanka. Coconut Research Institution of Sri Lanka, Cocos 2010;19:93-100.
19. Sit AK, Bhattacharya M, Sarkar B, Arunachalam V. Weed floristic composition in palm gardens in Plains of Eastern Himalayan region of West Bengal. Current Science 2007, 1434-1439.