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Effect of biomulches on weed flora on irrigated sunflower

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Abstract
A field experiment was conducted at Eastern Block Farm at Tamil Nadu Agricultural University, Coimbatore to evaluate biomulching as weed management practices on Sunflower during *Rabi*, 2018-19. The experiment was carried out in randomized block design with three replications. The treatments comprised of different biomulches *viz.,* live mulching with Sunhemp @ 40 kg ha^{-1}, Multi varietal crops (Navathaniyam) @ 50 kg ha^{-1}, *Terminalia chebula* powder @ 400 kg ha^{-1}, Mango leaves @ 4 t ha^{-1}, Tamarind leaf mulch @ 4 t ha^{-1}, Eucalyptus leaves @ 7 t ha^{-1}, Mustard seed powder @ 160 kg ha^{-1}, Neem leaves @ 2.5 t ha^{-1}, Two Hand weeding at 30 and 45 DAS and Weedy check @ Unmulched plot. The results revealed that application of Eucalyptus leaf mulch on the soil surface between the rows @ 7 t ha^{-1} and hand weeding twice at 30 and 45 DAS was effective in controlling weeds and recorded lower weed density, weed dry weight eventually resulting in higher yield of sunflower.

Keywords: Sunflower, biomulching, weed management, weed density, weed dry weight

Introduction
Sunflower (*Helianthus annuus* L.) is an annual plant that belongs to Heliaceace family and is an essential oilseed crop in the arid and semi-arid regions of the world. It is native to South America and Mexico, grown widely in tropical and sub-tropical regions of the world. Sunflower is the main source of edible oil in several parts of the world and is cultivated in 0.51 million hectare with a production of 5.85 million tonnes and productivity of 11.45 t ha^{-1}. This shortage of oil consumption has aggravated malnutrition. Sunflower is rich in poly unsaturated fatty acids (PUFA). But still, there is a wider scope for improving the sunflower yields. There are many constrains involved in increasing sunflower productivity, among them, weeds are the major threat which compete for space, light and nutrients ultimately resulting in a seed yield loss ranging from 45 to 65% (Wanjari *et al.*, 2000) [1]. Sunflower crop is poor competitor against weeds because of its slow growth at early stage, and therefore effective weed management practices could improve productivity from the the system. Critical period of weed competition was found to be 20 to 49 days after sowing (Wanjari *et al.*, 2000) [1]. Involving bio mulches to control weeds have a greater scope for effective weed management of weeds as the biomulches are eco-friendly, sustainable, locally available and low cost materials (Goswami and Saha, 2006) [2]. Therefore, this present study was conducted to evaluate the effect of biomulches on the weed flora of sunflower.

Materials and Methods
Field experiment was conducted at Eastern Block at Tamil Nadu Agricultural University, Coimbatore during *rabi* 2018. The experimental site is geographically located in western agro climatic zone of Tamil Nadu at 11°N latitude and 77°E longitude and at an altitude of 433m mean sea level. Soil of the experimental site was clay loam with a pH 8.43, low in organic carbon (0.42%) and medium in available nitrogen (220 kg ha^{-1}), medium in available phosphorus (17.5 kg ha^{-1}) and high in available potassium (439 kg ha^{1}). Experiment was laid out in randomized blocks design with three replications and ten treatments. The treatments comprised of different biomulches *viz.*, T$_1$ - Live mulching with sunhemp @ 40 kg ha^{-1} and incorporation on 30 DAS; T$_2$ -Multi varietal Crops (Navathaniyam) @ 50 kg ha^{-1}; T$_3$- *Terminalia chebula* powder @ 400 kg ha^{-1}; T$_4$ -Mango leaves @ 4 t ha^{-1}; T$_5$ -Tamarind leaf mulch @ 4 t ha^{-1}; T$_6$ -Eucalyptus leaves @ 7 t ha^{-1}; T$_7$ -Mustard seed powder @ 160 kg ha^{-1}; T$_8$ -Neem leaves @ 2.5 t ha^{-1}; T$_9$ -Two hand weedings at 30 and 45 DAS; and T$_{10}$ -weedy check (un-mulched plot). The leaf mulches like eucalyptus, mango, tamarind leaves neem leaves were spread uniformly between the crop rows on 3 day after sowing. Sunhemp, multi-varietal seeds technique (Navathaniyam) were sown at the time of sowing in between the rows of sunflower since sunflower is widely spaced crop and were incorporated as live mulch at 30

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days after sowing. *Terminalia chebula* powder, mustard seed powder was dusted uniformly on the soil surface in between the rows. Hand weeding twice was done at 30 and 45 days after sowing to T_9 alone as per treatment schedule. Observations on weed density were made using quadrat (0.5 m x 0.5 m) and weed control efficiency was calculated as suggested by Burnsisde and wicks (1965) [3] and Mani *et al.* (1973) [4]. The cost of cultivation, gross return, net return and benefit cost ratio were calculated on the basis of prevailing market price of different inputs to the outputs. The weed data was subjected to square root transformation and weed control efficiency was calculated and other data were statistically analyzed as per the procedure given by Gomez and Gomez (1984).

Results and Discussion
Weed flora
Weed flora of the experimental field was dominated by five grasses, one sedge and four broad leaved weeds. The predominant weed species of grasses were *Echinochloa colonum, Cyandon dactylon, Dactyloctenium aegyptium, Chloris barbata* and *Panicum repens,* sedges like *Cyperus rotundus* and broad leaved weeds like *Trianthema portulacastrum, Parthenium hysterophorus, Digera arvensis* and *Datura meta.* Predominance of similar weeds in sunflower were also reported by Renukaswamy *et al.* (2012) [6].

Weed density
Weeds were counted treatment wise at different stages. Unweeded plot accounted for higher weed density (Table.1). After hand weeding twice at 30 and 45 DAS which recorded a weed density of (3.21, 7.8 and 4.99 per m^{-2}) at 30, 60 and 90 DAS respectively mulching with Eucalyptus leaves at 7 t ha^{-1} was significant in reducing the weed density (3.43, 8.5 and 5.25 per m^{-2}) at 30, 60 and 90 DAS. This might have been due to the allelopathic effect of eucalyptus leaves supressing the germination of weeds. The discharge of these secondary

substances from eucalyptus might have occurred through leaching eventually inhibiting the seed germination and hypocotyl growth of several weed species (Babu and kandasamy, 1997) [7].

Weed dry weight
The application of different biomulches revealed that after hand weeding twice at 30 and 45 DAS which recorded a weed dry weight (5.9, 8.5 and 6.6 g m^{-2}) which was at par with Eucalyptus leaf mulching at 7 t ha^{-1} accounted for the lower weed dry weight (6.2, 9.0 and 7.6 g m^{-2}) at 30, 60 and 90 DAS, respectively (Table 1). This was followed by mulching with Mango leaves at 4 t ha^{-1} which was at par with *Terminalia chebula* powder @ 400 kg ha^{-1} was noticed significant in hampering the weed dry weight through its smothering efficiency and allelochemicals present such as phenolics, tannins etc (Rokiek *et al.*, 2010) [8]. While, Unweeded control plot was found obvious with higher weed dry weight and confirmed with the results of competition Singh *et al.* (1997) and Mikulka *et al.* (1999) [10].

Weed control efficiency
Weed control efficiency was calculated as an indicator for assessment of weed in comparison with the control (Table 1). After hand weeding twice at 30 and 45 DAS, mulching with Eucalyptus leaves at 7 t ha^{-1} showed improved weed control efficiency of 66.5 per cent at all the stages by effectively supressing the weed emergence and weed growth might be due to the release of many volatile germination inhibitors like p-coumaric acid, caffeic acid upon decomposition resulted detrimental to the weeds Puig *et al.* (2018) [11]. This was followed by mulching with Mango leaves at 4 t ha^{-1} which was at par with *Terminalia chebula* powder @ 400 kg ha^{-1} was noticed significant with improved weed control efficiency. Mulching with neem leaves 2.5 t ha^{-1} and mustard seed powder 160 kg ha^{-1} showed poor weed control efficiency.

Table 1: Effect of biomulches on weed density, weed dry weight (g m^{-2}) and weed control efficiency (%) of irrigated sunflower

Treatment	Weed Density (No. m^{-2})			Weed Dry Weight (g m^{-2})			Weed Control Efficiency (%)		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1 - Live mulching with sunhemp @ 40 kg ha^{-1}	6.37 (86.0)	14.15 (199.9)	8.84 (77.7)	10.5 (187.8)	15.5 (241.2)	13.9 (193.6)	37.9	42.4	36.8
T_2 - Live mulching with Multi varietal Crops (Navathaniyam) @ 50 kg ha^{-1}	6.48 (92.5)	14.8 (218.1)	9.01 (80.7)	10.6 (197.2)	16.5 (272)	14.4 (205.9)	37.4	38.8	34.8
T_3 - *Terminalia chebula* powder @ 400 kg ha^{-1}	5.34 (76.5)	11.9 (141.2)	7.34 (53.4)	8.9 (144.6)	12.9 (165.1)	11.6 (134.3)	47.3	52.3	47.3
T_4 - Mango leaves @ 4 t ha^{-1}	4.84 (71.17)	11.5 (132.0)	6.87 (46.7)	8.4 (134.4)	12.1 (145.3)	10.4 (108.7)	50.5	55.3	52.6
T_5 - Tamarind leaf mulch @ 4 t ha^{-1}	6.60 (97.8)	15.2 (232.0)	9.14 (83.1)	10.9 (209.2)	17.2 (296.2)	14.8 (217.3)	35.5	36.2	33.0
T_6 - Eucalyptus leaves @ 7 t ha^{-1}	3.43 (40.4)	8.5 (71.1)	5.25 (27.1)	6.2 (64.1)	9 (81.4)	7.6 (57.9)	63.3	66.5	65.3
T_7 - Mustard seed powder @ 160 kg ha^{-1}	8.05 (133)	17.0 (289.7)	10.77 (115.7)	13.1 (293.9)	20.3 (411.8)	18.3 (335)	22.7	24.8	16.9
T_8 - Neem leaves @ 2.5 t ha^{-1}	7.94 (140.5)	17.4 (303.1)	10.77 (115.5)	13.0 (296.9)	20.8 (434.1)	18.9 (356)	23.3	22.7	14.3
T_9 - Two Hand weeding at 30 and 45 DAS	3.21 (34.4)	7.8 (60.1)	4.99 (24.4)	5.9 (56.8)	8.5 (72.5)	6.6 (43.0)	65.4	68.3	70.1
T_{10} - Weedy check @ Unmulched plot	11.04 (238.2)	21.8 (474.4)	14.07 (197)	17 (501.3)	27 (727.5)	22 (485)	0.0	0.0	0.0
SED	0.21	0..47	0..29	0.35	0..53	0..47	-	-	-
CD (P=0.05)	0.64	1.4	0.87	1.05	1.61	1.42	-	-	-

Figures in parenthesis are original values; data subjected to square root transformation ($\sqrt{x+0.5}$), DAS – Days after sowing.

Conclusion

From the study it could be concluded that, mulching with Eucalyptus leaves @ 7 t ha^{-1} is effective in controlling broad spectrum of weeds with no effect on the sunflower crop in a sustainable, chemical free and profitable way of approach.

References

1. Wanjari RH, Yaduraj NT, Ahuja KN. Critical period of weed competition in spring sunflower. Ind. J Weed Sci 2000; 32:17-20.
2. Goswami SB, Saha S. Effect of organic and inorganic mulches on soil moisture conservation, weed suppression and yield of elephant- foot yam (*Amorphophallus paeoniifolius*). Indian journal of agronomy. 2006; 51(2):14-156.
3. Burnside OC, Wicks GA. Effects of herbicide and cultivation treatments on yield components of dryland sorghum in Nebraska. Agronomy Journal. 1965; 57(1):21-24.
4. Mani VS, Gautam KC, Dass B, Singh YR. Integrated weed management for sustainable agriculture. In: Proceedings of 3rd All India weed control Seminar, Indian Journal of Weed Science, 1973, 48.
5. Gomez KA, Gomez AA.. Statistical Procedures for Agricultural Research. 2nd edition, John Wiley India Pvt. Ltd., New York, USA, 2010, 704.
6. Renukaswamy NS, Prashant Kusagur, Jayaprakash R. Synergetic effects of herbicide mixtures on weed management in sunflower. International Journal of Food, Agriculture and Veterinary Sciences. 2012; 2(1): 75-79.
7. Chandra Babu R, Kandasamy OS. Allelopathic Effect of *Eucalyptus globulus* Lahill. on *Cyperus rotundus* L. and *Cynodon dactylon* L. Pers. Journal of Agronomy & Crop Science. 1997; 179:123-126
8. El-Rokiek KG, El-Masry RR, Messiha NK, Ahmed SA. The allelopathic effect of mango leaves on the growth and propagative capacity of purple nutsedge (Cyperus rotundus L.). Journal of American Science. 2010; 6(9):151-159
9. Singh VB, Giri G. Influence of intercropping and weed control measures on dry matter accumulation and nutrient uptake by sunflower and groundnut and their effect on succeeding maize. Indian Journal of Agronomy. 2001; 46(1):50-55.
10. Mikulka J *et al*. Weeds of Field, Meadows and Gardens. Praha: ČZU Praha (in Czech), 1999
11. Carolina Puig G, Lorena Álvarez-Iglesias, Manuel J Reigosa and Nuria Pedrol *Eucalyptus Globulus* Leaves Incorporated as Green Manure for Weed Control in Maize Weed Science. 2013. 61(1):154-161.