



Short Communication

Yield, quality and weed dynamics in *Sida* hemp (*Sida alnifolia* L.) as influenced by growing condition, manuring and weed management methods

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Abstract

A field experiment was undertaken to assess the performance of *Sida* hemp under different growing conditions, manuring and weed management methods at Agronomy farm of College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur during 2018-19. Treatments comprised two growing conditions (open and 50 per cent shade), two levels of manuring (no manure and FYM@10 t ha⁻¹), and four weed management practices (black polythene mulching, organic mulching with paddy straw @ 5 t ha⁻¹, hand weeding and no weeding). Taller plants were observed under 50 per cent shaded condition. Growing condition, manuring and weed management significantly influenced the root yield of *Sida alnifolia*. The highest root yield of 882 kg ha⁻¹ was recorded in crops grown under open condition. The yield under shaded condition was 658 kg ha⁻¹. The highest root yield was recorded in treatment combination, black polythene mulching with FYM under open condition (1466 kg ha⁻¹), followed by black polythene mulching without manure under open condition (1192 kg ha⁻¹). Significantly higher total alkaloid content (3.13 per cent) was observed in plants grown under open condition. Mulching with black polythene resulted in better control of weeds, followed by organic mulching.

Key words: Growing condition, Manuring, Mulching, *Sida* hemp, Weed management.

Sida alnifolia is a species found in tropical and subtropical regions of India. There are different common names for the crop like Arrow leaf *Sida* or *Sida* hemp (English), Bala (Sanskrit), and Kurumthotti (Malayalam). Roots are used in a variety of Ayurvedic medicines, and oils to improve strength of bones, muscles and joints. According to National Medicinal Plant Board (NMPB), *Sida* is the third most widely consumed drug in Ayurveda pharmaceutical industry and is mostly collected from the wild. Quality of raw drug is as important as its quantity in medicinal plant cultivation. Since bulk of the present requirement is met by wild collection from natural habitats, when the crop is brought under cultivation, improved management techniques are indispensable to ensure its quality. Cultivating plants under a microclimate similar to

its niche original is found to be the viable solution for ensuring therapeutic properties. An experiment was therefore designed to study the effect of agronomic management namely, variations in growing condition, manuring and weed management on growth, yield, quality and weed competition in *Sida* hemp.

A field experiment in Randomized Block Design (factorial) with 16 treatment combinations and 3 replications was conducted at the Agronomy farm, Department of Agronomy, College of Horticulture, Vellanikkara during June - December 2018. The treatments consisted of two growing conditions (open and 50 per cent shade), two manuring levels (no manure and FYM@10 t ha⁻¹), and four weed management practices (black polythene mulching,

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organic mulching with paddy straw @ 5 t ha⁻¹, hand weeding at 1, 3, 5 MAP and no weeding). One month old healthy, uniform sized seedlings were transplanted in the main field as per treatments. The observations on plant height, root yield and quality were recorded at harvest from five tagged plants. The observations on weed density and weed dry weight were recorded at 1, 3, 5 MAP and at harvest from each plot using a quadrat of 0.25 m². Total alkaloid content of roots at the time of harvest was estimated using the method of Harborne (1973). The data collected were subjected to analysis of variance using the statistical package 'OPSTAT'

Plant height at 1, 3, 5 MAP and at harvest

Taller plants were observed under 50 per cent shaded condition (106.07cm). The plant height under open condition was 88.12 cm (Table 1). According to Abdel-Mawgoud et al. (1996), plants grown under shade tried to increase capturing of intercepted light

Table 1. Effect of treatments on plant height, root yield and total alkaloid content of *Sida hemp*

	Plant height at harvest (cm)	Root yield at harvest (kg/ha)	Alkaloid content (%) in roots
Growing condition			
Open	88.12	882	3.13
50% Shade	106.07	658	2.80
CD (0.05)	1.82	20.29	0.20
Manuring			
No manure	93.46	715	2.92
FYM @10t/ha	100.73	826	3.02
CD (0.05)	1.82	18.29	NS
Weed management			
Black polythene	118.20	1111	3.02
Organic mulch	103.12	711	2.98
Hand weeding	98.13	659	2.96
No weeding	68.93	599	2.90
CD (0.05)	2.58	14.55	NS

by increasing interception area which led to increased plant height. Increased plant height was observed with FYM @ 10 t ha⁻¹ throughout growth. FYM application has been reported to improve crop growth by supplying plant nutrients including micronutrients as well as improving soil physical, chemical and biological properties (Dejene and Lemlem, 2012). Plants under black polythene mulch

recorded taller plants during all stages of observation. Mulching with paddy straw was the next best treatment with respect to plant height. In *Solanum*, increase in plant height due to mulching with black polythene was reported by Kaur (2015). According to Pramanik (1999), plant height and crop growth were increased under paddy straw mulching. Increase in plant height in treatments with mulching can be related to favourable microclimatic parameters observed under mulched soil as compared to bare soil.

Root yield

Growing condition, manuring and weed management significantly influenced the total root yield of *Sida alnifolia* (Table 1). The highest yield of 882 kg ha⁻¹ was recorded in crops grown under open condition. The yield under shaded condition was only 658 kg ha⁻¹. According to Latha and Radhakrishnan (2015), the yield and yield attributing characters like number of roots, root yield per plant and root length were considerably higher under open condition. Lower root yield under shade might be due to more vegetative growth as indicated by taller plants and poor allocation of assimilates to root portion. With respect to manuring, application of FYM @ 10 t ha⁻¹ resulted in better root yield of 826 kg ha⁻¹. Among weed management methods, mulching with black polythene recorded the highest root yield of 1111 kg ha⁻¹ and the lowest yield was from plots without weeding (599 kg ha⁻¹).

Interaction effect of growing condition, manuring and weed management was significant with respect to both root yield and alkaloid content in roots (Table 2). The highest root yield was recorded in the treatment combination, black polythene mulching with FYM under open condition (1466 kg ha⁻¹) followed by black polythene mulching without manure under open condition (1192 kg ha⁻¹). Under best treatment combination of manuring and weed management (FYM @ 10 t ha⁻¹ and black polythene), by altering only growing condition, a yield increase of 500 kg could be observed. This

Table 2. Interaction effect of growing condition, manuring and weed management on total root yield (kg/ha) and total alkaloid (%) of *Sida* hemp

Treatments	Total root yield (kg/ha)		Total alkaloid content in roots (%)	
	Harvest		Harvest	
	Open	50% shade	Open	50% shade
No manuring xBlack polythene	1192	805	3.08	2.86
No manuring xOrganic mulch	745	595	3.07	2.79
No manuring xHand weeding	709	550	3.04	2.81
No manuring xNo weeding	605	513	2.94	2.75
FYM @ 10t/ha xBlack polythene	1466	982	3.31	2.84
FYM @ 10t/ha xOrganic mulch	885	619	3.24	2.82
FYM @ 10t/ha xHand weeding	767	610	3.23	2.78
FYM @ 10t/ha xNo weeding	689	587	3.16	2.76
CD (0.05)	29.09	0.40		

indicated the sun loving nature of *Sida alnifolia*. Ideal growing condition, nutrient availability, and reduced weed infestation in this combination might have contributed to higher root yield.

Total alkaloid content of roots

Significantly higher total alkaloid content was observed in plants grown under open condition (3.13 per cent) whereas in shaded condition it was 2.80 per cent (Table 1). However, manuring and weed management did not exhibit any significant

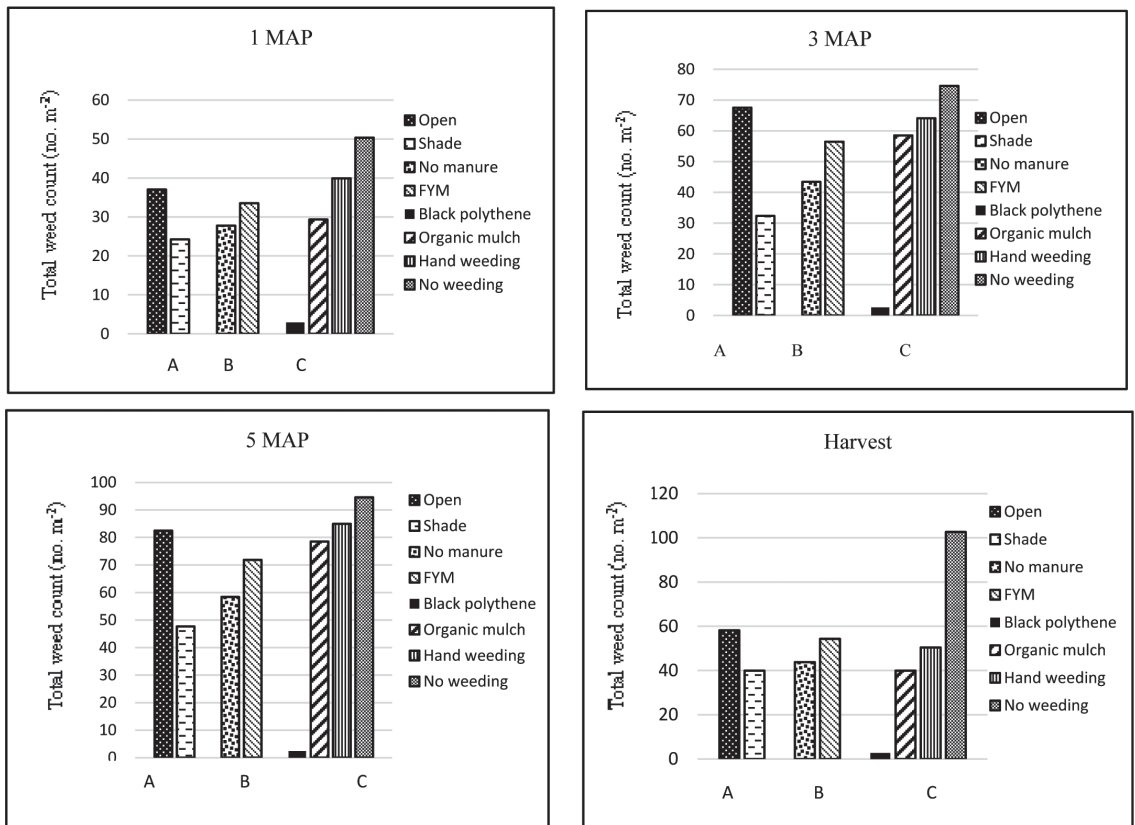


Figure 1. Effect of growing condition, manuring and weed management methods on weed density (no./m²) of *Sida* hemp A-Growing condition B-Manuring C-Weed management

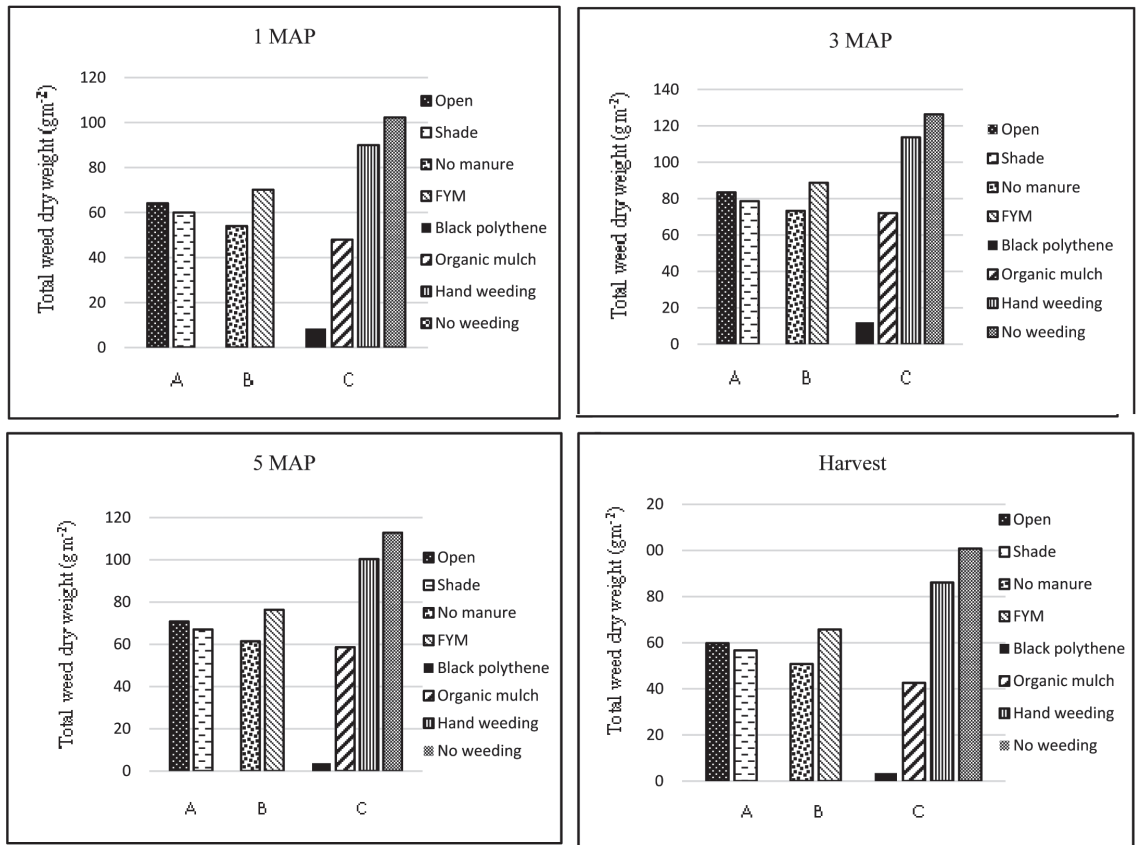


Figure 2. Effect of growing condition, manuring and weed management methods on weed dry weight (g/m²) of *Sida hemp*

influence on total alkaloid content. Influence of sunlight on enhanced production of alkaloids in medicinal plant *Pinellia ternate* was reported by Zhang et al. (2009). According to them, alkaloid and guanosine content in *Pinellia ternate* was higher under full light intensity. Regarding interaction effect, combination of mulching with black polythene and application of FYM under open condition resulted in better alkaloid content of 3.31 per cent, however, it was on par with all treatment combinations of manuring and weed management under open growing condition (Table 2).

Weed density and dry weight at 1, 3, 5 MAP and at harvest

Typical upland weeds were mainly found in experimental field. The main grass weeds observed were *Eleusine indica*, *Panicum maximum* and

Ischaemum indicum. The broad leaf weeds were *Borreria hispida*, *Mollugo disticha*, *Emilia sonchifolia* and *Phyllanthus amara*. Weed density and weed dry weight were significantly influenced by growing condition. As compared to open, weed density and weed dry weight were less under shade with 24.21 no./m² and 60.02 g/m², 32.33 no./m² and 78.57 g/m², 47.67 no./m² and 66.99 g/m², 39.92 no./m² and 56.67 g/m² respectively at 1, 3, 5 MAP and at harvest (Figs. 1 and 2). The reduced light availability under shade might be the reason for reduced weed growth under shaded condition. In general, FYM applied plots recorded higher weed density and weed dry weight with 33.50 no./m² and 70.14 g/m², 56.46 no./m² and 88.71 g/m², 71.83 no./m² and 76.33 g/m², 54.29 no./m² and 65.73 g/m² respectively at 1, 3, 5 MAP and at harvest. Similar results of increased weed density with addition of

FYM were reported earlier by Jama et al. (1997). Among weed management practices, the highest weed density and weed dry weight were recorded under no weeding plots. The lowest weed density and weed dry weight were observed under black polythene mulching with 2.92 no./m² and 8.46 g/m², 2.58 no./m² and 12.01 g/m², 2.42 no./m² and 3.71 g/m², 2.75 no./m² and 3.44 g/m² respectively at 1, 3, 5 MAP and at harvest. According to Schonbeck and Evanylo (1998) black polythene mulch suppressed the weeds, except for the few which emerged through the planting hole. According to Gunasekaran and Shakila (2014), weed suppression in black polythene mulch was effected by increasing the soil temperature which killed the weed seeds in early stages, and by inhibited light availability.

From the present study, the combination of open condition, application of FYM @ 10 t ha⁻¹ and weed management by black polythene mulching can be recommended as optimum for better yield, quality and weed control in *Sida* hemp.

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