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Impact of Planting Dates and Stage of Harvesting on Growth Dry Matter Production and Distribution of Ashwagandha (*Withania sominifera* Dunal.)

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Abstract

Studies on planting dates and stage of harvesting in ashwagandha was conducted on medium deep black soil during *kharif* season of 2007-08, to know the optimum date of planting and stage of harvesting. The results showed that planting on II FN of July recorded the highest plant height (29.97 cm), number of leaves (33.76), leaf area (30.64 dm^2/plant), leaf area index (15.12) and were on par with I FN of August. Planting on II FN of July recorded the highest dry matter production (37.58 g/plant) and its distribution in leaves (8.21 g/plant), stem (11.60 g/plant), and reproductive parts (16.46 g/plant). Among stage of harvesting, the crop harvested at 100% flowering stage recorded the highest number of leaves (30.85), leaf area (30.08 dm^2/plant), leaf area index (13.64), dry matter accumulation in leaves (9.51 g/plant) and also these were on par with 50% flowering stage. However, the crop harvested at maturity stage recorded significantly higher plant height (31.64 cm), dry matter production (37.33 g/plant) and its distribution in stem (12.52 g/plant) and reproductive parts (20.48 g/plant) and also these were on par with berry ripening stage.

Key words : Ashwagandha, Planting dates, Stage of harvesting, Dry matter production.

Ashwagandha (*Withania sominifera* Dunal.), an important plant of solanaceae family, grows wild in arid and semi-arid regions. It is widely used for the several chronic diseases like arthritis, bronchitis, female sexual disorders, stomach and lung inflammations. It also improves potency and provides sound sleep due to its anti stress properties. These medicinal values are attributed to the presence of several alkaloids, mainly withanin content which ranges from 0.13 to 0.31% (1). Crop diversification involving ashwagandha may increase income of the farmer. However, improved practices for ashwagandha cultivation are yet to be standardized. Agronomic manipulations play a vital role in its establishment, growth and performance through changing its morphological features, physiological functioning and the duration to complete its life cycle. The research information on response of ashwagandha to various planting dates and stage of harvesting is meager. The present investigation was therefore undertaken on ashwagandha to assesss optimum date of planting and right stage of harvesting for obtaining higher root growth, yield and quality.

Methods

A field experiment was conducted at College of Agriculture, Raichur (Karnataka) during *kharif* season of 2007-2008. The climate of the region is semi arid with a temperature of 39.9 and 30.5 C during summer and winter respectively. The annual rainfall varies between 600 and 700 mm of which 90% is received during July to September. The pH of soil is 8.51 and Ec is 0.17ds/m. The experiment comprised combination of four planting dates (II FN of July, I FN of August, II FN of August, I FN of September) and four stages of harvesting (50% flowering stage, 100% flowering stage, berry ripening stage and maturity stage). The 16 treatment combinations were replicated four times in split plot design. The seeds of ashwagandha cv Jawahar ashwagandha -20 were hand sown uniformly in the furrows based on treatments. A uniform doses of 12 kg N and 24 kg P_2O_5 were applied as basal. After 35 days of planting one hand weeding was done to reduce the crop weed competion. The crop was harvested as per the treatments by uprooting the plants from the net plot area of each plot sepa-

Table 1. Impact of planting dates and stage of harvesting on growth, dry matter production and distribution of ashwagandha (*Withania sominifera* Dunal.).

Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (dm^2/ plant)	Leaf area index (LAI)	Dry matter production (g/plant)	Dry matter accumulation		
						Leaves	Stem	Reproductive parts
Planting Dates (S)								
S_1 II Fortnight of July	29.97	33.76	30.64	15.12	37.58	8.21	11.60	16.46
S_2 I Fortnight of August	28.97	30.61	28.23	13.11	32.69	7.53	10.85	15.06
S_3 II Fortnight of August	24.71	24.26	23.40	10.39	27.75	6.12	9.56	12.49
S_4 I Fortnight of September	23.10	20.64	22.78	10.18	26.68	5.88	9.08	12.14
SE ±	1.42	1.39	1.11	0.47	2.02	0.39	0.35	0.47
CD at 5%	4.90	4.81	3.84	1.63	6.98	1.34	1.21	1.62
Stage of Harvesting (H)								
H_1 50% Flowering stage	22.78	30.55	29.91	13.34	24.80	9.05	8.15	7.60
H_2 100% Flowering stage	23.73	30.85	30.08	13.64	25.91	9.51	8.50	7.90
H_3 Berry ripening stage	30.20	24.83	23.34	11.26	36.96	4.85	11.93	20.18
H_4 Maturity stage	31.64	23.07	21.78	10.55	37.33	4.33	12.52	20.48
SE ±	1.04	1.10	1.97	0.65	1.51	0.50	0.68	0.90
CD at 5%	3.04	3.20	5.74	1.90	4.43	1.46	2.00	2.63

rately. The roots were dipped in clean water to remove soil. Above ground parts were cut to detach the roots. The bundle of roots so separated was weighed to record fresh weight and then air dried to note dry weight. The data were analyzed statistically as decribed by panse and Sukhatme (2).

Results and Discussion

Table 1 revealed that different planting dates and stage of harvesting significantly influenced the growth, dry matter production and its distribution of ashwagandha. At harvest, the dry matter production and its distribution in leaves, stem and reproductive parts was significantly higher under II FN of July (37.58g/plant, 8.21 g/plant, 11.60 g/plant and 16.46g/ plant respectively) planting over other treatments except when planted at IFN of August. Similarly at harvest, highest plant height, number of leaves, leaf area and leaf area index was also found significantly higher under II FN of July (29.97 cm, 33.76, 30.64 dm^2/ plant and 15.12 respectively) planting except I FN of August. This might be due to favorable environmental conditions *viz*., rainfall, sunshine, temperature, day length, etc. available to the plants when planted on II FN of July and in trun might have led to better physiological functioning and higher accumulation of photosynthates. The above results are in accordance with those of Agarwal et al. (3).

Results also showed that, the crop harvested at 100% flowering stage recorded significantly higher number of leaves, leaf area, leaf area index and dry matter accumulation in leaves (30.85, 30.08dm^2/plant, 13.64 and 9.51 g/plant respectively) over other treatments except when harvested at 50% flowering stage. As the growth advanced the number of leaves, leaf area, leaf area index and dry matter accumulation in leaves increased and attained maximum at 90 DAS and reduced at harvest due to leaf senescence. However the crop harvested at maturity stage recorded significantly higher plant height (31.64 cm), dry matter production (37.33 g/plant) and its distribution in stem (12.52 g/plant) and reproductive parts (20.48 g/ plant) over other treatments except berry ripening stage. The values of growth parameters increased with delay in harvesting of the crop. The above results corroborate the findings of Farooqui and Srinivas (4).

It can be summarized that earliest planting i.e. II FN of July resulted in significantly higher dry matter production and its distribution in leaves, stem and reproductive parts. Similarly highest plant height, number of leaves, leaf area and leaf area index was

also found under II FN of July (29.97 cm, 33.76, 30.64 dm^2/plant, 15.12 respectively). Results further showed that, the highest plant height (31.64 cm), dry matter production (37.33 g/plant) and its distribution in stem (12.52g/plant) and reproductive parts (20.48 g/plant) was recorded when the crop was harvested at maturity stage.

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