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IMPACT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH AND YIELD OF DAVANA (*Artemisia pallens* Wall.) UNDER HILL ZONE OF KARNATAKA

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ABSTRACT

An experiment was conducted during the year 2011-12 to to study the influence of integrated nutrient management on growth and yield of Davana" at College of Horticulture, Mudigere, Karnatakaka. At 75 days after transplanting significantly taller plants (45.18 cm) were found in plots receiving 75%RDF + *Azospirillum* 2 kg ha^{-1} (T_5). The maximum number of leaves per plant (147.16), laterals per plant (19.49), stem girth (1.41 cm), were registered in 50%RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1} (T_{12}), which was on par with T_5 - 75%RDF + *Azospirillum* 2 kg ha^{-1} Fresh herbage yield per plant differed significantly due to integrated nutrient management. Application of 75%RDF + *Azospirillum* 2 kg ha^{-1} (T_5) recorded the significantly maximum fresh herbage yield per plant (20.64 g), which was on par with T_{12} (20.63 g) and T_{11} (18.83 g). Whereas, significantly minimum herbage yield was recorded (13.24 g) in RDF + PSB 2 kg ha^{-1} (T_4).

INTRODUCTION

Davana (*Artemisia pallens* Wall.) belongs to family Asteraceae has diploid chromosome number of 2n=16, is a common aromatic plant of south India grown for its leaves and flowers and prized for its fruity fragrance. It forms an important component in garlands and bouquets, where springs of davana lend an element of freshness and a rich sumptuousness of odour (Balakubahan *et al.*, 2011). Its cultivation is mainly concentrated in southern parts of Karnataka and lesser extent in Tamil Nadu, Andhra Pradesh, Kerala and Maharashtra. The sprigs of davana are widely used in floral composition by women folk for decorating their hairs. Among various agronomic practices for higher production nutrients are most important. The use of organic fertilizers and biofertilizers along with balanced use of inorganic fertilizers is of paramount importance in horticulture in general and medicinal and aromatic crops in particular. An integrated nutrient management concept is one of the eco-friendly approaches, which can be incorporated to attain higher crop productivity and sustainability.

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Commercial cultivation of davana emphasizes the need for having good nutrient management practices to achieve higher yield and returns and in this regard, INM practices may be the best solution. keeping this in view the present study was undertaken to study the influence of integrated nutrient management on davana under hill zone of Karnataka,

MATERIALS AND METHODS

The field experiment was carried out at the farm field of the division of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Mudigere, during 2011-12. The experiment was laid out in Randomised Complete Block Design with twelve treatments and three replications in open field condition. The spacing was 15 x 7.5cm and the net plot size 1.125 cm^2. There were 12 treatments combinations consisting of different levels of nutrients.

T_1: Control: RDF (120:40:40 kg NPK ha^{-1} + FYM 6 t ha^{-1})
T_2: RDF + *Azospirillum* 2 kg ha^{-1}
T_3: RDF + *Azotobactor* 2 kg ha^{-1}
T_4: RDF + PSB 2 kg ha^{-1}
T_5: 75%RDF + *Azospirillum* 2 kg ha^{-1}
T_6: 75%RDF + *Azotobactor* 2 kg ha^{-1}
T_7: 75%RDF + PSB 2 kg ha^{-1}

T_8: RDF + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1}
T_9: 75%RDF + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1}
T_{10}: RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kgha^{-1}
T_{11}: 75%RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1}
T_{12}: 50%RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1}

Nursery and planting

Nursery beds of 1 sq. meter dimension were prepared. Required amount of seeds for the experiment at the rate of 1½ kg ha^{-1} were mixed thoroughly with 8 times of its volume of fine dry sand (1:8 ratio) and sown in the rows all over the bed. A thin layer of sand is then spread uniformly to cover the seeds and the beds were watered twice a day. Forty days old healthy seedlings of uniform height were selected and transplanting in the main field. Recommended dose of fertilizers were applied and necessary care was taken. Harvesting was carried out when the plants were at 50% bloom stage and exhibited a yellowish appearance in the field. The observations were recorded for growth and yield parameters and the data was analysed as per statistical procedure given by Sunderaraj *et al.* (1972).

RESULTS AND DISCUSSION

The vegetative growth parameters differed significantly among the different treatments at all the stages of crop growth. Application of (T_5 - 75%RDF + *Azospirillum* 2 kg ha^{-1}) organic manures and inorganic fertilizers in combination with bio-fertilizers resulted in maximum plant height (45.42 cm). Nitrogen being the main constituent of protein and nucleic acid, which greatly influenced the cell division, cell enlargement and thereby it could increase the shoot length. This was in conformity with the findings of Ravindra (1987) and Senthil Kumar *et al*, (2009) in davana. The number of leaves, number of laterals and stem girth increased with increase in the age upto vegetative phase of the crop. At harvest, maximum number of leaves per plant (147.2), maximum number of laterals(19.49) and maximum stem girth(1.41) were recorded in plants supplied with 50%RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1} $_{(T12)}$. Increased and number of leaves, laterals and stem girth are due to higher fertilizer application particularly with nitrogen, enhanced better photosynthetic activity and production of carbohydrates and its utilization in buildup of cells and their elongation. It was also related to the influence of biofertilizers, which produced the substances similar to the effects of growth hormones leading to better vegetative growth. A similar variation in growth parameters was reported by Gandhi Kumar and Vijay Kumar (1996) in davana. Application of 75%RDF + *Azospirillum* 2 kg ha^{-1} (T_5) recorded maximum fresh herbage yield (18.3 t). Nitrogen helps the plants by promoting luxuriant vegetative growth by causing synthesized photosynthates to get metabolically converted into protein and thereby adding to the production of more vegetative tissues. Phosphorus application would have helped in better absorption and efficient utilization of phosphorus as the soil was low in available phosphorus. Potassium aids in the effective conversion of photosynthates for the better growth and ultimately yield of the plant (Dasar, 2004). The treatment receiving application of 50%RDNPK + Vermicompost 2.5 t ha^{-1} + *Azospirillum* 2 kg ha^{-1} + PSB 2 kg ha^{-1} (T_{12}) recorded maximum essential oil yield per hectare (15.04 kg), which was on par with T_5-75%RDF + *Azospirillum* 2 kg ha^{-1} (15.03 kg). The reason for increase in oil yield might be due to the influence of nitrogen and *Azospirillum* in promoting the vegetative growth which resulted in increased herbage

Table 1. Growth of Davana as influenced by Integrated nutrient management

Treatments		75 Days after Transplanting			
		Plant height (cm)	No. Of leaves	No. Of laterals	Stem girth (cm)
T_1	Control - RDF	36.40	123.14	12.45	1.24
T_2	RDF + *Azospirillum*	40.28	136.66	13.94	1.33
T_3	RDF + *Azotobactor*	41.76	132.37	13.68	1.30
T_4	RDF + PSB	40.98	131.44	12.85	1.27
T_5	75% RDF + *Azospirillum*	45.18	146.64	18.91	1.41
T_6	75% RDF + *Azotobactor*	41.17	132.00	17.15	1.26
T_7	75% RDF + PSB	39.44	128.33	14.75	1.30
T_8	RDF +*Azospirillum*+ PSB	40.77	126.62	17.27	1.33
T_9	75% RDF + *Azospirillum* +PSB	43.16	133.30	13.90	1.29
T_{10}	RDNPK+ VC+ *Azospirillum* +PSB	40.91	131.77	15.73	1.31
T_{11}	75% RDNPK +VC+ *Azospirillum* +	41.68	132.55	17.76	1.33
T_{12}	50% RDNPK +VC+ *Azospirillum* +PSB	44.01	147.16	19.49	1.41
	F-test	*	*	*	*
	S.Em±	0.86	1.71	0.56	0.01
	CD at 5%	2.53	5.00	1.64	0.04
	CV %	3.61	2.21	6.19	1.60

Table 2. Herbage and essential oil yield of Davana as influenced by integrated nutrient management

Treatments		Herbage yield	Essential oil yield
		Ton/Ha	Kg/Ha
T_1	Control - RDF	12.40	12.33
T_2	RDF + *Azospirillum*	15.09	13.73
T_3	RDF + *Azotobactor*	13.91	12.96
T_4	RDF + PSB	11.73	11.80
T_5	75% RDF + *Azospirillum*	18.30	15.03
T_6	75% RDF + *Azotobactor*	16.22	13.62
T_7	75% RDF + PSB	12.58	12.23
T_8	RDF + *Azospirillum*+ PSB	15.37	13.71
T_9	75% RDF + *Azospirillum* + PSB	12.96	12.47
T_{10}	RDNPK + VC + *Azospirillum* +PSB	15.59	13.87
T_{11}	75% RDNPK+ VC+ *Azospirillum* +PSB	16.68	13.07
T_{12}	50% RDNPK+VC+ *Azospirillum* +PSB	18.26	15.04
	F- test	*	*
	S.Em±	0.56	0.37
	CD at 5%	1.65	1.10
	CV %	6.52	4.87

production, consequently the essential oil yield increased to a greater extent. This is in accordance with the results of Kumarvel (2003) in *Artemisia annua.*

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