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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON STEM GIRTH, INTER NODAL LENGTH AND YIELD (SEED YIELD & POD YIELD) OF AMBRETTE (A*BELMOSCHUS MOSCHATUS* MEDIC.) IN SANDY CLAY LOAM SOIL

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Abstract

An investigation was undertaken to study the effect of integrated nutrient management practices on growth and yield characters of Ambrette (*Abelmoschus moschatus* Medic.). The design followed was randomized block design with three replications. The trial was conducted with recommended dose of fertilizers (120 : 30 : 40 kg NPK ha^{-1}) along with neem coated urea (NCU) , enriched pressmud compost (EPMC) and Sea weed extract (SWE). The observations on stem girth, inter nodal length at different stages, pod yield $plot^{-1}$ and seed yield $plot^{-1}$ were recorded and analyzed statistically. The results revealed that integrated application of 75% RDF-N (NCU) + P (EMPC) + SWE (T_8) recorded maximum values for stem girth, inter nodal length at different stages, pod yield and seed yield $plot^{-1}$ in ambrette.

Key words: Ambrette, INM, stem girth, internodal length and seed yield plot & pod yield $plot^{-1}$

Introduction

Abelmoschus moschatus Medic. is an aromatic and medicinal plant in the Malvaceae family, which is native to India. The genus Abelmoschus has six species distributed in South East Asia and North Australia. *Abelmoschus manihot*, *Abelmoschus esculentus* and *Abelmoschus moschatus* are wild and cultivated forms, while *Abelmoschus ficulneus*, *Abelmoschus crinitus* and *Abelmoschus angulosus* are only wild. It is an erect hispid herbaceous trailing herb that grows up to 1.5m tall with a long slender tap root. The seeds have a sweet, flowery, heavy fragrance similar to that of musk. Every part of this medicinal plant is used in one or the other way. The bitter, sweet, acrid, aromatic seeds are used as a tonic and are considered to possess cooling, aphrodisiac, ophthalmic, cardiotonic, digestive, stomachic, carminative, pectoral, diuretic, stimulant, antispasmodic and deodorant properties. Ambrette seeds are exported to Canada, France, Nepal, Spain, UAE and United Kingdom to the extent of about 116 quintals in a year because of its diversified uses (Oudhia and Tripathi, 2000). This increasing demand has motivated the farmers to cultivate this important medicinal crop in fairly large areas. However, they often do not adopt scientific cultivation practices. For maintaining optimum productivity of the land and building up of soil fertility, the use of organic manures along with inorganic fertilizers to crops has been suggested. It is a well known fact that the availability of organic manures is very much limited in the present day agriculture (Annadurai *et al.,* 2001). With this back-ground in view, the present investigation was undertaken to study the effect of integrated nutrient management practices on *Abelmoschus moschatus* in sandy clay loam soil.

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Materials and Methods

A field experiment was conducted at sivapuri village, Cuddalore (district), Tamilnadu during May to October, 2018 with a spacing of 60 × 45 cm. Seeds collected from the Department of Horticulture, University of Agricultural Sciences, Bangalore. The experiment was laid out in a randomized block design with three replications. The trial

was conducted with recommended dose of fertilizers (RDF) @ 120: 30: 40 kg NPK ha^{-1} along with combination of neem coated urea (NCU) @ 5:1 ratio by weight, enriched pressmud compost (EPMC) @ 1000 kg ha^{-1} was mixed with SSP. Sea weed extract (SWE) was applied as foliar spray three times at 30 days interval. The treatments comprised of T_1– Absolute control, T_2 – 100% RDF, T_3 – 75% RDF -N (NCU), T_4 –75% RDF - P (EPMC), T_5 – 75% RDF - N (NCU) + P (EPMC), T_6 – T_3 + SWE, T_7 - T_4 + SWE and T_8 – T_5 + SWE. The neem coated urea and enriched pressmud compost were applied during field preparation as basal. The observations on stem girth and internodal length were measured and recorded at 30, 60, 90, 120 and 150 DAS. The pod yield and seed yield $plot^{-1}$ recorded from each treatment and each replication.

Results and Discussion

Stem girth (cm)

The observations recorded on stem girth at different stages are presented in Table 1. Stem girth significantly differed due to different treatments.

At 30 DAS, significantly highest stem girth of 2.65 cm was recorded with T_8 which received 75%RDF-N(NCU)+P(EMPC)+SWE. Application of 75%RDF-N(NCU)+SWE (T_6) recorded the stem girth of 2.00 cm was on par with application of 75%RDF-P(EMPC)+SWE registered the stem girth of 2.21 cm. Application of 100% RDF recorded the stem girth of 1.75 cm in T_2 whereas, the lowest stem girth (1.26 cm) was found to be with control (T_1).

At 60 DAS, there was a significant increase in stem girth from 2.17 to 4.24 cm was observed in T8 which was received 75% RDF-N(NCU) + P(EMPC) + SWE compared to control. Application of 100% RDF (T_2), 75% RDF-N (NCU) (T_3) and 75% RDF-P (EMPC) (T_4) registered the stem girth of 2.80, 2.63 and 2.42 cm, respectively. Application of 75% RDF-N (NCU) + SWE (T_6) registered the stem girth (3.69 cm) was on par with 75% RDF-P (EMPC) + SWE (T_7) (3.60 cm).

Among the treatments tried at 90 DAS, application of 75% RDF-N (NCU) + P (EMPC) + SWE (T_8) recorded significantly highest stem girth of 5.47 cm. Application of 75% RDF-N (NCU) + SWE and 75% RDF-P (EMPC) + SWE recorded the stem girth of 4.60 and 4.53 cm, respectively. However, the lowest stem girth (3.12 cm) was observed under control treatment which received no organic manures and inorganic fertilizers.

At 120 DAS, significantly highest stem girth ((7.12 cm) was recorded due to application of 75% RDF-N (NCU) + P (EMPC) + SWE noticed in T_8. Application of 100% RDF registered the stem girth of 5.43 cm was on par with 75% RDF-N (NCU) + P (EMPC) (T_5) (6.95 cm). However, the control registered the stem girth of 4.45 cm which was lowest stem girth found in T_1.

At harvest also, application of 75% RDF-N (NCU) + P (EMPC) + SWE (T_8) recorded the highest stem girth of 8.22 cm compared to control recorded the stem girth of 5.89 cm. There was a significant differences due to treatments. Application of 75% RDF-N (NCU) + SWE (T_6) and 75% RDF-P (EMPC) + SWE (T_7) recorded the stem girth of 7.16 cm. These two treatments were on par with each other. However, the lowest stem girth (5.89 cm) was observed under control treatment which received no organic manures and inorganic fertilizers.

This could be due to application of higher dose of fertilizers increased chlorophyll content, a component responsible for high rate of photosynthesis. The other possible reason could also be that enhanced nitrogen supply might have resulted in increased amino acid and protein synthesis, which are ultimately responsible for vigorous vegetative growth of the plant. This was accordance with the finding of Upadhyay and Misra (1999). This was also might be due to sea weed and their extracts increased plant height, number of leaves $plant^{-1}$ and number of branches $plant^{-1}$ enhanced stem girth (Khan *et al.,* 2009).

Inter nodal length (cm)

It can be observed from the data presented in Table 1, significant differences were registered among the various treatments with regard to intermodal length.

At 30 DAS, among the various treatments tested, application of 75% RDF N (NCU) + P (EMPC) + SWE (T_8) recorded the maximum intermodal length of 3.80 cm. This was followed by 3.10 and 3.00 cm were noticed in T_6 and T_7 were received 75% RDF-N (NCU) + SWE (T_6) and 75% RDF-P (EMPC) + SWE (T_8), respectively. The minimum intermodal length of 1.60 cm was recorded in T_1.

At 60 DAS, the highest intermodal length of 4.89 cm was noticed in T_8 which received 75% RDF + N (NCU) + P (EPMC) + SWE. Application of 100% RDF registered the intermodal length of 4.12 cm. This was on par with T_5 (75% RDF + N (NCU) + P (EPMC) (4.25 cm). The lowest intermodal length (3.38 cm)was observed under control treatment (T_1).

At 90 DAS, application of 75% RDF + N (NCU) + P (EPMC) + SWE recorded significantly highest intermodal length (6.76 cm). The next best intermodal length of 5.78 and 5.77 cm were registered with T_6 and

Table 1: Effect of integrated nutrient management practices on growth characters (stem girth) and inter nodal length in ambrette.

	Stem girth (cm)					Inter nodal length (cm)				
Treatments	30 DAS	60 DAS	90 DAS	120 DAS	At harvest	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
T_1 - Absolute control	1.26	2.17	3.12	4.45	5.89	1.60	3.38	3.24	4.82	6.28
T_2_100% RDF	1.75	2.80	3.90	5.43	6.81	2.70	4.12	5.12	5.92	6.01
T_3-75% RDF –N (NCU)	1.31	2.63	3.56	5.16	6.26	2.25	3.68	4.49	5.32	6.45
T_4- 75% RDF –P(EPMC)	1.56	2.42	3.50	4.56	6.74	2.00	3.76	4.70	5.40	6.65
T_5-75%RDF-N(NCU)+P (EPMC)	1.67	3.01	4.11	5.49	6.95	2.81	4.25	5.37	6.00	6.03
T_6- T_3+SWE	2.00	3.69	4.60	6.27	7.23	3.10	4.70	5.78	6.42	6.95
T_7- T_4+SWE	2.21	3.60	4.53	6.24	7.16	3.00	4.67	5.77	6.48	6.85
T_8- T_5+SWE	2.65	4.24	5.47	7.12	8.22	3.80	4.89	6.76	6.89	7.79
S.Ed	0.148	0.140	0.143	0.284	0.401	0.270	0.066	0.150	0.184	0.342
CD=0.05	0.350	0.332	0.338	0.672	0.094	0.638	0.156	0.356	0.436	0.808

Table 2: Effect of integrated nutrient management practices on yield characters (pod yield plot^{-1} and seed yield plot $^{-1}$) in ambrette.

Treatments	Pod yield plot $^{-1}$ (g)	Seed yield plot $^{-1}$ (g)
T_1 - Absolute control	412.93	321.62
T_2_100% RDF	591.72	530.90
T_3-75% RDF –N (NCU)	480.80	462.18
T_4- 75% RDF –P(EPMC)	512.05	470.63
T_5-75% RDF –N (NCU) + P (EPMC)	603.31	534.70
T_6- T_3+SWE	666.90	619.14
T_7- T_4+SWE	655.20	607.45
T_8- T_5+SWE	704.40	681.14
S.Ed	29.13	15.27
CD=0.05	48.26	30.54

T_7. These two treatments were on par. Application of 100% RDF (T_2) and 75% RDF + N (NCU) (T_3) were recorded the intermodal length of 5.12 and 4.49 cm, respectively. There was a significant difference was noticed between these two treatments. Whereas the lowest internodal length of 3.24 cm was found to be with T_1.

At 120 DAS, the treatments T_1, T_2, T_3, T_4 registered the internodal length of 4.82, 5.92, 5.32 and 5.40 cm, respectively. Among the different treatments tried, application of 75% RDF + N (NCU) + P (EPMC) + SWE (T8) recorded the highest internodal length (6.89 cm). This treatments significantly differed with T_7 (6,48 cm) which was received 75% RDF + P (EPMC) + SWE. Whereas this treatment on par with T_6 (6.42 cm).

At harvest, application of 100% RDF (T_2) registered the internodal length of 6.01 cm. This was statistically significant with 7.79 cm observed in T_8 which received 75% RDF + N (NCU) + P (EPMC) + SWE. Among the treatments tried, T_2 and T_5, T_6 and T_7 were on par with each other. Whereas the absolute control registered the lowest internodal length of 6.28 cm which received no organic manures and inorganic fertilizers. This was accordance with the finding of Upadhyay and Misra (1999).

Pod yield plot^{-1}(g)

The data on pod yield plot^{-1} presented in Table 2 concluded that pod yield significantly different due to different combinations of inorganic fertilizers, neem coated urea, enriched pressmud compost and sea weed extract.

Among the various treatments tested, the highest pod yield plot^{-1} of 704.4 g was observed in T_8 which received 75% RDF + N (NCU) + P (EPMC) + SWE. It was followed by 666.9 and 655.2g were found to be with T_6 (75% RDF + N (NCU) + SWE) and T_7 (75% RDF + P (EPMC) + SWE), respectively. There was a significant difference between these two treatments. However, the lowest pod yield plot^{-1} (412.93g) was noticed in T_1 which received no organic manures and inorganic fertilizers. The increase in pod yield could be attributed to the neem oil coating and slow nutrient releasing property of neem coated urea which could have thereby reduced the nutrients losses and maintained the availability of nutrients for a longer time that resulted in better growth parameters thus increasing the marketable pod yield. Similar result was reported Prasad *et al.,* (1999) in rice crop. This was also might be due to integrated application of NPK and pressmud compost accelerated mobility of photosynthates influenced by plant hormones from the source to sink. Similar observations were stated by Senjobi *et al.,* (2013).

Seed yield plot^{-1} (g)

The data on seed yield plot^{-1} presented in Table 2 revealed that there was a significant influence between the treatments with respect to seed yield plot^{-1}.

The seed yield plot^{-1} was significantly highest in T_8 (75% RDF + N (NCU) + P (EPMC) + SWE) (681.14

g). this was followed by T_6 - 75% RDF + N (NCU) + SWE and T_7-75% RDF + P (EPMC) + SWE recorded the seed yield plot^{-1} of 619.14 and 607.45 g, respectively. The treatments T_6 and T_7 as well as T_2 and T_5 were on par with each other. However, the lowest seed yield plot^{-1} of 321.62 g was noticed under control treatment (T_1). This could be due to the combined application of organic manures and inorganic fertilizers. The earlier report of Arumugamshakila and Rajeswari (2015) support the present findings. The increase in seed yield might be attributed to the production of more number of pods with greater size. The results obtained are in conformity with findings of Aravind and Gill (1998) in Bhendi.

Conclusion

Hence, from the results of this present investigation it may stated that conjoint application of 75% RDF + N (neem coated urea) + P (enriched pressmud compost @ 1000 kg ha^{-1}) and sea weed extract @5% three sprays at 30 days interval markedly increased the stem girth, internodal length, pod yield and seed yield plot^{-1} in ambrette grown in sandy clay loam soil.

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