www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 2045-2050

www.thepharmajournal.com
Received: 02-01-2023
Accepted: 06-02-2023

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Effect of planting date and INM on growth and yield in mint (*Mentha arvensis* L.) during summer season under north coastal plains of Andhra Pradesh

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Abstract

The present investigation entitled "Effect of planting date and INM on growth and yield in mint (*Mentha arvensis* L.) during *Summer* season under north coastal plains of Andhra Pradesh" is carried out at COH, Parvathipuram, Dr. Y.S.R. Horticultural University, during *Summer* season 2021. The experiment was laid out in factorial randomized block design with combinations of four planting dates (first fortnight of February, second fortnight of February, first fortnight of March and second fortnight of March) and four nutrient doses (N_l - 100% RDN, N_2 - 75% RDN+ (12.5% FYM + 12.5% Vermicompost) + Rhizobium + PSB + KMB, N_3 - 50% RDN + (25% FYM + 25% Vermicompost) + Rhizobium + PSB + KMB and N_4 - 100% organic (50% FYM + 50% Vermicompost) in *Summer* season. The results revealed that growth parameters like plant height (66.75 cm), plant spread (91.79 cm), number of primary branches (31.93) and number of secondary branches (7.63 respectively) number of leaves per plant (1073.98 at 120 DAP, 790.93 at 150 DAP) and yield parameter fresh herbage yield per plant (106.96 g plant^{-1} at first harvest, 66.84 g plant^{-1} at final harvest) recorded maximum when crop planted on first and second fortnights of February. Among different treatment combinations N_2 followed by N_3 was superior in terms of growth and yield which recorded maximum plant height (66.80 cm), plant spread (89.20 cm), number of primary branches (27.57) and number of secondary branches (7.29) number of leaves per plant (925.75 at 120 DAP, 641.95 at 150 DAP) and yield parameter fresh herbage yield per plant (99.16 g plant^{-1} at first harvest, 62.89 g plant^{-1} at final harvest).

Keywords: Japanese mint, planting date, INM, biofertilizers, menthol

Introduction

Japanese mint (*Mentha arvensis* L.), also known as menthol mint, field mint, a member of *Lamiaceae* is a perennial herbaceous aromatic plant but cultivated as annual for natural menthol. The shade dried herb upon distillation yields mint oil, further processing (chilling) provides menthol crystals and de-mentholised mint oil. It is valuable commercially because of its high oil yield and the menthol content. Over the years, the essential oils extracted from these plants have become precious and indispensable ingredients of the fragrance, pharmaceuticals and flavour industry (Joy *et al*., 1998) [12]. Since the research done on this crop under north coastal plains of Andhra Pradesh itself is very meager, there is a need for development of package of practices for its large scale cultivation for betterment of the farming community. Hence, the study was undertaken with an objective to standardize optimum planting date and the effect of INM on growth and yield in mint during *Summer* season under north coastal plains of Andhra Pradesh.

Materials and Methods

The experiment was conducted during *Summer* 2021 at college farm, COH, Parvathipuram, Parvathipuram Manyam Dist. The experimental fields were located at 18^{0}47' N latitude, 83^0 26' E longitude and 18^0 48'N latitude, 83^0 30' E longitude respectively. The average monthly maximum and minimum temperatures were 37.26 °C and 14.26 °C respectively. The monthly mean relative humidity ranged from 51.44% to 69.57%. A total rainfall of 320.45 mm was recorded during the crop period. Soil of the experimental field belongs to Visakhapatnam soil series, taxonomically typic haplustept, fine, mixed, semiactive, iso-hyperthermic, non-calcareous and sandy loam texture. The initial soil characteristics revealed that the soil was neutral in pH, non- saline with low available N, medium P, K and Organic carbon.

In the present study among different cultivars grown in India, the Kosi variety released from CIMAP, Lucknow was taken having the characteristics of early maturing habit, resistant to diseases like leaf spot, rust and powdery mildew, oil yield of 200-250 Kg ha^{-1} and menthol content of 75-80% at our experimental field. The experimental site was brought to fine tilth by ploughing deeply with tractor drawn reversible double mouldboard plough followed by passing rigid type cultivator and rotovator for clod crushing and weed removal. Then the plots of 3m width and 4m length were laid out and separated by bunds of 30 cm width and irrigation channels were provided as per experiment lay-out.

The planting material (stolons) of uniform thickness were separated. They were cut into 7.0 to 10.0 cm long cuttings having 2-3 nodes and dipped in 0.3 per cent Copper oxy chloride (COC) for 5-10 minutes before planting in the nursery. The plants from nursery were uprooted, once they attains stage of 4-5 leaves and sturdy growth after 25-30 days period they were transplanted into the main field and then irrigated.

The furrows were opened at 40 cm interval in each plot. Healthy and disease free plant saplings were collected from the nursery and planted at 15 cm spacing, at a depth of 2.5 to 4.0 cm and later covered with soil. The seed rate followed was 400 kg stolons ha^{-1}. FYM was applied during land preparation. N at the rate of 125 kg ha^{-1} as per treatments in the form of urea was applied in two split doses at the time of transplanting and after first harvest. P @ 40 kg ha^{-1} and K @ 60 kg ha^{-1} were given as basal doses. Biofertilizers like PSB, Rhizobium and KMB @ 5 kg ha^{-1} each were mixed together with vermicompost and applied as per the treatment dose.

The crop was harvested at 100 and 150 days after planting when the crop was at fifty per cent flowering. The plants were cut at 1 to 4 cm height from the ground level by using sharp sickle during late morning hours. The data on plant height, plant spread, number of primary branches, number of secondary branches, number of leaves $plant^{-1}$, and fresh herbage yield $plant^{-1}$ were recorded from five randomly selected plants from each treatment in each replication.

Statistical Analysis: Statistical analysis for the data recorded was done by following the analysis of variance for randomized block design with factorial concept as suggested by Gomez and Gomez (1984). The significance was tested by applying F-test at 0.05 level of probability and critical differences were calculated for those parameters which turned to the significant ($p<0.05$) in order to compare the effects of different treatments.

Results and Discussion

Plant height (cm)

Significant difference for plant height at different planting dates was observed at 120 and 150 DAP. Among the planting dates, the highest plant height of 66.75 cm was recorded for S_2 followed by S_1 of 62.70 cm and lowest plant height of 49.75 cm was recorded in S_4 at 150 DAP. Among different levels of nutrient combinations plant height was significant at 120 and 150 DAP. The highest plant height of 66.80 cm for N_2 followed by N_3 (63.43 cm) and lowest plant height of 55.53 cm was recorded in N_1 at 150 DAP (Table 1).

Significant difference for interaction effects was recorded at 150 DAP. Among the interaction effects the highest plant height of 72.33 cm in S_2N_2 followed by S_2N_3 with 70.39 cm and the lowest plant height of 42.73 cm was recorded in S_4N_4 at 150 DAP (Table 2).

Increased plant height at second fortnight of February (S_2), N_2 (75% RDN + 12.5% FYM + 12.5% Vermicompost + PSB + Rhizobium + KMB) and in S_2N_2 treatments could be due to favourable weather conditions at early planting date which might have influenced the plants by available nutrients in the soil and there by increasing cell division and cell elongation. The combination of organic, inorganic and biofertilizers facilitated better availability and uptake of nutrients. Lowest plant height was recorded in second fortnight of March due to increase in temperature and N_1 treatment due to nutrient leaching losses and lack of moisture in the soil. The results are in conformity with the findings of Akhtar *et al*. (2009) [1], Chauhan *et al*. (2012) [6], Taleie *et al*. (2012) [22], Sharma (2012) [19], Brar *et al*. (2014) [5], Elrasheed *et al*. (2014) [7], Sakr *et al*. (2014) [17], Nilofer *et al*. (2015) [15], Kumar *et al*. (2017) [13], Jnanesha *et al*. (2018) [11], Swetha *et al*. (2018) [20], Amir and Mensure (2021) [2], Aswani *et al*. (2021) [3], Hamed *et al*. (2021) [9].

Plant spread (cm)

Significant difference for plant spread at different planting dates was recorded at 120 and 150 DAP. Among the dates of planting, the highest plant spread of 91.79 cm for S_1 followed by S_2 of 89.40 cm and lowest plant spread of 70.04 cm was recorded in S_4 at 150 DAP. Significant difference for plant spread among different levels of nutrients was recorded at 120 and 150 DAP. The highest plant spread of 89.20 cm for N_2 followed by N_1 (84.26 cm) and lowest plant spread of 82.84 cm was recorded in N_4 at 150 DAP. (Table 1)

Significant difference for interaction effects was recorded at 150 DAP. Among the interaction effects the highest plant spread of 101.35 cm in S_1N_2 followed by S_2N_2 of 94.81 cm whereas the lowest plant spread of 61.67 cm was recorded in S_4N_4 at 150 DAP. (Table 2)

Higher plant spread under the scenario of S_1 (first fortnight of February), nutrients of N_2 (75% RDN + 12.5% FYM + 12.5% Vermicompost + PSB + Rhizobium + KMB) and in S_1N_2 might be due to moderate temperature at the time of planting, which favoured better establishment and growth of shoots and root, thus plants could utilize balanced nutrition more efficiently which might have increased the spread whereas the lowest plant spread was recorded in second fortnight of March due to rise in temperatures and N_4 treatment due to slower release of nutrients into soil ecosystems which were not available to plants during their growth period. The results are in conformity with the findings of Akhtar *et al*. (2009) [1], Sharma *et al*. (20012) [19], Jayanthi *et al*. (2013) [10], Brar *et al*. (2014) [5], Elrasheed *et al*. (2014) [7], Nilofer *et al*. (2015) [15], Kumar *et al*. (2017) [13], Jnanesha *et al*. (2018) [11], Swetha *et al*. (2018) [20], Mahantesh *et al*. (2019) [14] and Aswani *et al*. (2021) [3].

Primary branches $plant^{-1}$

Significant difference for primary branches at different planting dates was recorded at 120 and 150 DAP. Among the dates of planting, the highest number of primary branches of 31.93 for S_1 followed by S_2 of 30.95 and lowest number of primary branches of 14.52 was recorded in S_4 at 150 DAP. Significant difference for primary branches among different levels of nutrients was recorded at 120 and 150 DAP. The highest number of primary branches of 27.57 for N_3 followed by N_2 (27.55) and lowest number of primary branches of

22.20 was recorded in N_4 at 150 DAP. (Table 1)
Non-significant difference was observed at 150 DAP. Among the interaction effects the highest number of primary branches 36.47 in S_1N_3 followed by S_1N_2 of 36.00 whereas the lowest number of primary branches of 12.27 was recorded in S_4N_4 at 150 DAP. (Table 2)
Highest number of primary branches under planting at S_1 (first fortnight of February), nutrients of N_2 (75% RDN + 12.5% FYM + 12.5% Vermicompost + PSB + Rhizobium + KMB) and in S_1N_3 might be due to appropriate climatic conditions at the time of planting. And also availability of more nitrogen to the plants due to the combined application of fertilizers enhanced the production of plant growth hormones and assisted in better utilization of reserved carbohydrates available in soil which leads to profuse branching and luxuriant growth of plants.
Whereas the number of primary branches were lowest in second fortnight of March and nutrients (N_4) treatment because of unfavourable climate and slow release of nutrients. The results are in conformity with the findings of Akhtar *et al*. (2009) [1], Chauhan *et al*. (2012) [6], Sharma *et al*. (2012) [19], Jayanthi *et al*. (2013) [10], Brar *et al*. (2014) [5], Nilofer *et al*. (2015) [15], Kumar *et al*. (2017) [13], Swetha *et al*. (2018) [20] and Aswani *et al*. (2021) [3].

Secondary branches plant^{-1}
The significant differences for secondary branches at different planting dates was recorded at 120 and 150 DAP. Among the dates of planting, the highest number of secondary branches of 7.63 for S_2 followed by S_3 of 7.24 and lowest number of secondary branches of 5.64 was recorded in S_4 at 150 DAP. However significant differences for secondary branches among different levels of nutrients was recorded at 120 and 150 DAP. The highest number of secondary branches of 7.29 for N_2 followed by N_1 (7.04) and lowest number of secondary branches of 5.97 was recorded in N_4 at 150 DAP (Table 1).
The significant differences for interaction effects was recorded at 150 DAP. Among the interaction effects the highest number of secondary branches 9.40 in S_2N_3 followed by S_3N_2 of 8.47 whereas the lowest number of secondary branches of 5.20 was recorded in S_4N_3 at 150 DAP (Table 2).
The number of secondary branches were minimum at initial stages of plant growth and as plant age proceeds the growth of secondary branches are in increasing trend and the highest number of secondary branches under second fortnight of February and nutrients of N_2 (75% RDN + 12.5% FYM + 12.5% Vermicompost + PSB + Rhizobium + KMB) was due to congenial climatic conditions at the time of planting and also the availability of more nitrogen to the plants due to the combined application of fertilizers with biofertilizers enhanced the production of plant growth hormones might have triggered the rapid cell division, proliferation of cells and speedy growth of plants. The lowest number of secondary branches were recorded in second fortnight of March and nutrients of N_4 treatments, this might be due to low nutrient availability and unfavourable climatic conditions. The results are in conformity with the findings of Akhtar *et al*. (2009) [1], Chauhan *et al*. (2012) [6], Sharma *et al*. (2012) [19], Jayanthi *et al*. (2013) [10], Brar *et al*. (2014) [5], Nilofer *et al*. (2015) [15], Kumar *et al*. (2017) [13], Swetha *et al*. (2018) [20] and Aswani *et al*. (2021) [3].

Number of leaves plant^{-1}
The significant differences for number of leaves at different dates of planting was recorded at 120 and 150 DAP. Among the planting dates, the highest number of leaves of 1073.98 for S_2 followed by S_1 of 1041.70 and lowest number of leaves of 532.20 was recorded in S_4 at 120 DAP. Similarly the highest number of leaves of 790.93 for S_2 followed by S_1 of 682.50 and lowest number of leaves of 398.78 was recorded in S_4 at 150 DAP.
The significant differences for number of leaves among different levels of nutrients was recorded at 120 and 150 DAP. The highest number of leaves of 925.75 for N_2 followed by N_3 (886.90) and lowest number of number of leaves of 615.28 was recorded in N_4 at 120 DAP. However, the highest number of leaves of 641.95 for N_2 followed by N_3 of 612.63 and lowest number of leaves of 468.87 was recorded in N_4 at 150 DAP (Table 1).
The significant differences for interaction effects was recorded at 120 and 150 DAP. Among the interaction effects the highest number of number of leaves 1238.93 in S_2N_2 followed by S_2N_3 of 1220.47 whereas the lowest number of number of leaves of 326.20 was recorded in S_4N_4 at 120 DAP. And also the highest number of number of leaves 865.00 in S_2N_2 followed by S_2N_3 of 861.27 whereas the lowest number of leaves of 197.13 was recorded in S_4N_4 at 150 DAP (Table 2).
The number of leaves were increased with increase in age of the crop but at 150 DAP the number of leaves per plant decreased due to leaf shedding. The increased growth parameters like plant height, number of primary and secondary branches further increased the number of leaves per plant. Number of leaves were highest in early planting dates might be due to the added benefits of organic fertilizers, biofertilizers to soil in conjunction with in organic fertilizers which increases availability of nutrients due to improvement in physical and biological properties of soil, which in turn results in formation of more number of leaves and also due to appropriate temperature prevailed during the growth period. The lowest number of leaves was recorded in last date of planting and organic treatments at 150 DAP this might be due to slowed down of growth rate, leaf senescence and low availability of nutrients. Similar results were also observed by Akhtar *et al*. (2009) [1], Sharma *et al*. (2012) [19], Taleie *et al*. (2012) [22], Brar *et al*. (2014) [5], Elrasheed *et al*. (2014) [7], Sakr *et al*. (2014) [17], Nilofer *et al*. (2015) [15], Kumar *et al*. (2017) [13], Jnanesha *et al*. (2018) [11] Aswani *et al*. (2021) [3] and Hamed *et al*. (2021) [9].

Fresh herbage yield (g plant^{-1})
The yield parameter fresh herbage yield per plant was recorded at 100 DAP (First harvest) and 150 DAP (Final harvest) for the effect of planting dates, nutrients and their interaction effects (Table 1).
The significant differences for fresh herbage yield per plant at different planting dates was recorded at 100 DAP (First harvest) and 150 DAP (Final harvest). Among the dates of planting, the highest fresh herbage yield per plant of 106.96 for S_1 followed by S_2 of 102.22 and lowest fresh herbage yield per plant of 59.05 was recorded in S_4 at 100 DAP. At final harvest the highest fresh herbage yield per plant of 66.84 for S_3 followed by S_2 of 58.55 and lowest fresh herbage yield per plant of 56.06 was recorded in S_4 at 150 DAP.
The significant differences for fresh herbage yield per plant among different levels of nutrients was recorded at 100 DAP (First harvest) and 150 DAP (Final harvest). The highest fresh

herbage yield per plant of 99.16 for N_2 followed by N_3 (96.43) and lowest fresh herbage yield per plant of 67.86 was recorded in N_1 at 100 DAP. At final harvest the highest fresh herbage yield per plant of 62.89 for N_2 followed by N_3 of 61.98 and lowest fresh herbage yield per plant of 53.21 was recorded in N_1 at 150 DAP.

The significant differences for interaction effects was recorded at 100 DAP (First harvest) and 150 DAP (Final harvest). Among the interaction effects the highest fresh herbage yield per plant of 137.04 in S_2N_3 followed by S_1N_3 of 134.98 whereas the lowest fresh herbage yield per plant of 49.15 was recorded in S_4N_4 at 100 DAP. At final harvest the highest fresh herbage yield per plant of 79.30 in S_3N_4 followed by S_3N_2 of 72.42 whereas the lowest fresh herbage yield per plant of 45.83 was recorded in S_4N_4 (Table 2).

Sustained availability of nutrients for longer periods results in luxuriant growth of plants which leads to increased growth parameters like higher plant height, number of leaves, branches and leaf area might be the possible reason for higher fresh herbage yield per plant. Moderate temperature and ample sunshine hours at the time of planting and first harvest gave higher yields. In addition use of biofertilizers increases root biomass, nitrogen supply through fixation of atmospheric nitrogen, increases water holding capacity for prolonged period makes luxuriant nutrient availability for crop growth. As per the results N_2 treatment and early planting dates can be followed without reduction in herbage yield. Lowest yields in N_4 and S_4 at first and final harvest might be due to lack of soil moisture, nutrients leaching losses and volatilization of nitrogen from the soil. This was in line with the findings of Sarma and Kanjilal *et al*. (2000) [18], Rajeswararao *et al*. (2001) [16], Taleie *et al*. (2012) [22], Brar *et al*. (2014) [5], Elrasheed *et al*. (2014) [7], Nilofer *et al*. (2015) [15], Jnanesha *et al*. (2018) [11], Mahantesh *et al*. (2019) [14], Aswani (2021) [3] and Hamed *et al*. (2021) [9].

Table 1: Effect of planting date and nutrients on growth and yield parameters during *Summer* season in mint (*Mentha arvensis* L.)

Treatments	Plant height (cm)		Plant spread (cm)		No. of Primary branches		No. of Secondary branches		No. of Leaves		Fresh herbage yield (g plant^{-1})	
	120 DAP	150 DAP	120 DAP	150 DAP	120 DAP	150 DAP	120 DAP	150 DAP	120 DAP	150 DAP	100 DAP	150 DAP
Planting dates												
S_1	59.52	62.70	91.63	91.79	27.25	31.93	5.44	6.83	1041.70	682.50	106.96	56.09
S_2	65.42	66.75	87.09	89.40	31.22	30.95	6.26	7.63	1073.98	790.93	102.22	58.55
S_3	61.86	62.28	97.99	88.37	23.72	25.30	5.85	7.24	541.40	429.15	76.08	66.84
S_4	47.58	49.75	65.33	70.04	12.08	14.52	4.23	5.64	532.20	398.78	59.05	56.06
S.Em±	0.67	0.73	0.97	1.20	1.02	0.82	0.23	0.20	12.48	11.20	3.76	1.88
CD (P = 0.05)	1.94	2.10	2.81	3.45	2.96	2.36	0.66	0.57	36.04	32.35	10.85	5.42
Nutrients (Kgha^{-1})												
N_1	57.43	55.53	83.85	84.26	23.63	25.38	5.66	7.04	761.35	577.92	67.86	53.21
N_2	63.80	66.80	91.92	89.20	25.17	27.57	5.90	7.29	925.75	641.95	96.43	62.89
N_3	60.43	63.43	84.99	83.30	25.00	27.55	5.60	7.03	886.90	612.63	99.16	61.98
N_4	52.72	55.72	81.28	82.84	20.47	22.20	4.62	5.97	615.28	468.87	80.86	59.47
S.Em±	0.67	0.73	0.97	1.20	1.02	0.82	0.23	0.20	12.48	11.20	3.76	1.88
CD (P = 0.05)	1.94	2.10	2.81	3.45	2.96	2.36	0.66	0.57	36.04	32.35	10.85	5.42

DAP- Days after transplanting NS- Non significant

S_1: First fortnight of February, S_2: Second fortnight of February, S_3: First fortnight of March, S_4: First fortnight of March

N_1: 100% RDN, N_2: 75% RDN+ (12.5% FYM + 12.5% Vermicompost) + Rhizobium + PSB + KMB, N_3: 50% RDN + (25% FYM + 25% Vermicompost) + Rhizobium + PSB + KMB, N_4: 100% organic (50% FYM + 50% Vermicompost)

Table 2: Interaction effects of planting date and nutrients on growth and yield parameters during *Summer* season in mint (*Mentha arvensis* L.)

Planting dates	Plant height (cm)				Mean	Plant spread (cm)				Mean	Primary branches				Mean
	Nutrients (kg ha^{-1}) 150 DAP					Nutrients (kg ha^{-1}) 150 DAP					Nutrients (kg ha^{-1}) 150 DAP				
	N_1	N_2	N_3	N_4		N_1	N_2	N_3	N_4		N_1	N_2	N_3	N_4	
S_1	57.89	69.85	66.27	56.77	62.70	84.36	101.35	89.50	91.94	91.79	30.80	36.00	36.47	24.47	31.93
S_2	57.41	72.33	70.39	66.89	66.75	87.85	94.81	88.95	86.01	89.40	31.67	31.00	32.13	29.00	30.95
S_3	56.94	69.95	65.73	56.49	62.28	88.17	87.44	86.12	91.76	88.37	25.47	28.13	24.53	23.07	25.30
S_4	49.87	55.05	51.33	42.73	49.75	76.67	73.21	68.62	61.67	70.04	13.60	15.07	17.13	12.27	14.52
Mean	55.53	66.80	63.43	55.72		84.26	89.20	83.30	82.84		25.38	27.55	27.57	22.20	
S.Em±	1.46					2.39					1.63				
CD (P= 0.05)	4.21					6.90					NS				

Planting dates	Secondary branches				Mean	No. of leaves				Mean	No. of leaves				
	Nutrients (kg ha^{-1}) 150 DAP					Nutrients (kg ha^{-1}) 120 DAP					Nutrients (kg ha^{-1}) 150 DAP				
	N_1	N_2	N_3	N_4		N_1	N_2	N_3	N_4		N_1	N_2	N_3	N_4	Mean
S_1	5.97	7.70	6.67	6.97	6.83	983.20	1159.40	1158.47	865.73	1041.70	683.27	724.67	713.73	608.33	682.50
S_2	7.67	7.43	9.40	6.00	7.63	991.40	1238.93	1220.47	845.13	1073.98	759.13	865.00	861.27	678.33	790.93
S_3	8.07	8.47	6.73	5.70	7.24	521.93	622.40	597.20	424.07	541.40	413.80	468.87	442.27	391.67	429.15
S_4	6.47	5.57	5.33	5.20	5.64	548.87	682.27	571.47	326.20	532.20	455.47	509.27	433.27	197.13	398.78
Mean	7.04	7.29	7.03	5.97		761.35	925.75	886.90	615.28		577.92	641.95	612.63	468.87	
S.Em±	0.39					24.96					22.40				
CD (P=0.05)	1.13					72.09					64.70				

Planting dates	Nutrients (kg ha^{-1}) 100 DAP				Mean		Nutrients (kg ha^{-1}) 150 DAP			Mean
	N_1	N_2	N_3	N_4		N_1	N_2	N_3	N_4	
S_1	80.90	126.56	134.98	85.41	106.96	57.06	55.49	56.51	55.32	56.09
S_2	80.32	108.86	137.04	82.68	102.22	53.13	57.48	66.14	57.46	58.55
S_3	57.00	81.57	59.57	106.20	76.08	54.05	72.42	61.61	79.30	66.84
S_4	53.23	68.75	65.04	49.15	59.05	48.59	66.16	63.67	45.83	56.06
Mean	67.86	96.43	99.16	80.86		53.21	62.89	61.98	59.47	
S.Em±	7.52						3.76			
CD (P=0.05)	21.71						10.85			

Conclusions

The impact of suitable planting date with congenial climatic conditions and integrated use of nutrients played an important role on performance of mint under north coastal plains of Andhra Pradesh. This study highlights the significance of usage of biofertilizers along with organic and inorganic source of nutrients on growth and yield characteristics. First fortnight of February and second fortnight of February planting with nutrient dose of N_2 (75% RDN + (12.5% FYM + 12.5% Vermicompost) + Rhizobium + PSB + KMB) followed by N_3 (50% RDN + (25% FYM + 25% Vermicompost) + Rhizobium + PSB + KMB).

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