International Journal of Plant & Soil Science

Volume 36, Issue 4, Page 346-351, 2024; Article no.IJPSS.113729
ISSN: 2320-7035

Influence of Different Sowing Times and Nutrient Management on Growthand Yield of Summer Sesame (*Sesamum indicum* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2024/v36i44487

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/113729

Original Research Article

Received: 01/01/2024
Accepted: 06/03/2024
Published: 11/03/2024

ABSTRACT

A field experiment was conducted during the summer season of 2019 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari. The experiment was laid out in split plot designit included three sowing dates *viz*.D_1:2nd week of February, D_2:4th week of February,D_3:2nd week of Marchas main plot as well as five nutrient management practices, including N_1:100% RDN, N_2:100% RDN + Sap (1%), N_3:75% RDN + Sap (1%), N_4:100% RDN + Urea (1%) , N_5:75% RDN + Urea (1%) as sub plot and replicated in four times. The results of this study showed that sesame sown on second week of march recorded higher growth parameters, *viz*, plant height (cm), dry matter accumulation (g/plant) as well as seed yield, stalk yield and

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harvest index while remaining noticeably on par with 4thweek of February. Among the nutrient management treatments, the significantly improved the growth parameters like plant height (cm), dry accumulation (g/plant) and yield of stalk was observed with crop fertilize 100% RDN along with Urea spray 1% which was statistically at par with 100% RDN and Sap spray 1%. Highest seed yield was recorded when the application of 100% RDN with Urea spray 1%.

Keywords: Sesame; date of sowing; nutrient management; growth; yield; dry accumulation; Sap spray; oil seed crop.

1. INTRODUCTION

Sesame is an importatant and ancient oil-yielding crop. It belongs to order Tubiflorae and family pedaliaceae. Sesame oil with 85 percent unsaturated fatty acid is highly stable and has reducing effect on cholesterol and prevents coronary heart disease. Hence, sesame is called as the " The queen of the oil seed crop " by virtue of its excellent quality and utility. It is also used in medicines and pharmaceuticals industries, bio-diesel, pet foods and component of many other products. “Production potentiality of a genotype can be fully exploited by adopting suitable agronomic practices. Among the available higher production technology selection of appropriate sowing time according to specific location and region is imperative phenomena to fully exploit the genetic potentiality of a variety as a synchronizes the optimum environmental condition such as temperature, light, humidity, rainfall *etc*. with the different growth phases of the crop and results in boosting production of summer sesame” [1]. “It is fact that particular genotype do not exhibit the same phenotypic characteristics in all environment circumstances. The responses of qualities, yield attributes and yield potential as well as of genotype varies for a specific or different date of sowing” [2]. “For synchronizing different stages of plant growth with environmental conditions, the appropriate sowing date is considered one of the most important determining factors for obtaining optimum yield Determining the optimum time of sowing, which in turn improves unit land area utilization and selecting a cultivar with a high average yield is a major factor in ensuring a profitable return of sesame. Sesame can be cultivated in sub-optimal conditions, mainly during February to May in summer. Cultivation of sesame faces certain physiological constraints like, heavy flower drop, slow dry matter accumulation and poor partitioning of assimilates from source to sink. These problems can be overcome by foliar application of macro and micro nutrients at critical stages of crop growth facilitates for quick supply of nutrients, there by promoting photosynthesis and mobilization of assimilates to sink and ultimately the yield” [3]. “Nitrogen is the most important nutrient for plant growth and is the most limiting nutrients in soil. It is the important constitute of chlorophyll and protein and implies dark green colour to the plants, promotes vegetative growth and rapid early growth. It plays pivotal role in quantitative as well as qualitative important in the productivity of oilseeds. The deficiency of nitrogen leads to synthesis of anthocyanin, which gives different types of colouration and young fruits tend to drop prematurely”. The enriched banana pseudostem sap (EBPS) is the value added product prepare from the pseudostem, about 15 to 20 thousand liters of sap can be extracted from one hectare psedostem. The EBPS contains several major and micro nutrients, plant growth regulators and this mixture is inoculated with different microbes like, *Rhizobium*, *Azatobacter etc*., which play an important role in enhancing the crop yield.

2. MATERIALS AND METHODS

A field experiment was undertaken at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer season of 2019. The soil of experimental site was low in available nitrogen (163.07 kg/ha), medium in available phosphorus (29.94 kg/ha) high in available potassium (435.56 kg/ha) and clayey in texture. The soil was slightly alkaline in reaction with normal electrical conductivity. The experiment was laid in split plot design with four replication where as main plots were assigned to three sowing dates viz., D_1: 2nd week of February, D_2: 4th week of February and D_3: 2nd week of March and sub plots to five nutrient management practices viz., N_1: 100 % RDN, N_2: 100% RDN + Sap (1%), N_3: 75% RDN + Sap (1%), N_4: 100% RDN + Urea (1%) and N_5: 75% RDN + Urea (1%). “Sesame variety Guj.

Table 1. Meteorological data recorded during the course of investigation

Month and Year	Std. Week	Dates	Temperature (°C)		Relative Humidity (%)		Wind velocity (Km/hr)	Sun shine (hrs/day)	Evaporation (mm)
			Max.	Min.	Mor.	Even.			
February	7	12-18	32.2	12.2	88.6	47.3	2.2	8.6	4.1
2019	8	19-25	33.6	13.3	88.7	49.5	2.5	9.1	4.7
	9	26-4	31.9	15.0	88.8	49.3	3.1	8.3	4.8
March 2019	10	5-11	31.6	14.6	94.2	49.4	2.5	7.5	4.8
	11	12-18	33.4	13.8	87.5	38.6	2.4	8.4	4.9
	12	19-25	35.7	15.7	85.7	44.4	2.5	8.9	4.7
	13	26-01	38.4	18.1	81.5	45.6	2.7	8.4	6.4
April 2019	14	2-8	33.8	21.2	89.0	61.4	4.3	8.5	5.2
	15	9-15	36.9	20.9	86.9	43.7	2.9	8.9	6.8
	16	16-22	36.7	21.9	80.7	50.1	3.1	8.3	5.3
	17	23-29	39.4	22.0	82.8	45.6	2.7	9.2	6.4
	18	30-06	33.8	23.9	86.4	65.3	6.9	10.3	5.9
May 2019	19	07-13	33.8	23.2	84.1	60.5	5.3	10.8	4.8
	20	14-20	34.6	24.1	84.3	58.3	4.5	10.0	5.7
	21	21-27	36.7	25.3	85.3	60.7	5.0	10.5	6.4
	22	28-3	34.5	26.2	86.6	71.0	7.3	10.1	6.2
June 2019	23	4-10	34.5	27.1	88.2	71.2	7.7	7.7	5.7

Til-5 seeds were sown at 45cm x 15cm spacing. Prior to sowing, the seeds were treated with liquid bio fertilizer *viz*., *Azospirillum*10 ml/kg of seed. Half dose of nitrogen as per treatment, full dose of phosphorus and sulphur were applied as basal just prior to sowing in the form of Urea and SSP. The remaining half dose of nitrogen as per treatment was applied in the form of urea at 30 days after each date of sowing. Two foliar spray of one percent banana pseudostem sap and urea (46 % N) were spraying on crop at branching and flowering stage as per treatments" [20]. The banana pseudo- stem contained macro elements in the range of 1 - 1.12 percent N, 0.50 - 0.71 per cent P, 2.39 to 20.2 per cent K and micro-nutrients in the range of 259 to 323.2 mg/kg Fe, 47.3 to 241.3 mg/kgMn, 10.1 to 107.4 mg/kgZn and 13.4 to 83.6 mg/kgCu [4]. The foliar spray of this sap helps to promote crop growth, protect crop from harmful pest and enhances crop yield. The weeds were managed by pre-emegence application of pendimethalin 30 EC herbicide applied after sowing on the same day. One hand weeding and interculturing was carried out during the early crop growth stages. The growth parameters were recorded at 30,45, 60 DAS and at harvest whereas the yield attributing and yield parameters were recorded at harvest. Data on different aspects of sesame crop were subjected to statistical analysis as per the procedure of Split Plot Design (Panse and Sukhatme, 1985).

3. RESULTS AND DISCUSSION

3.1 Effect of Date of Sowing and Nutrient Management on growth Parameters of Sesame

3.1.1 Plant height

The data revealed (Table 2) that as the significantly greater plant height of pearl millet was recorded in 2nd week of March sown crop at 30,45, 60 DAS and at harvest but found at par with 4th week of February. "The increase in the plant height with sowing on second week of March is quite obvious, because crop obtained optimum environment for growth. It may also be attributed to rise in temperature after germination of the crop, which enhanced the rate of growth and development and more growing degree days received during crop growth period. However, cold spell in early sowing of crop affected the plant height adversely. The differences in vegetative growth in terms of plant height due to sowing dates" Chongdar et al. [5] and Salem [6].

With regard to nutrient management practices, application 100% RDN + Urea (1%) recorded higher plant height at 30,45, 60 DAS and at harvest, which was statistically at par with 100% RDN + Sap (1%) (N_2) and 75% RDN + Sap (1%) (N_3). "Nitrogen promotes the vegetative growth thus, leading to significant increase in plant height. This might be due to nitrogen application had lead to effective absorption and translocation of nutrients and resulted in production of more number of new nodes. Better translocation of photosynthates from source to sink due to

adequate supply of nutrients to the crop led to improvement of growth characteristics". The findings are in close conformity with the results of Singhal et al. [7], Vani et al. [8] and Gujjar et al. [9].

3.1.2 Dry matter accumulation

Second week of March (D_3) coupled with favorable climate conditions, especially temperature, humidity which produced higher dry matter at 30, 45, 60 DAS and at harvest but, found at par with sowing at fourth week of February (D_2). The results are close conformity with those of Ghosh (2000) and Chongdar et al. [5].

"Application of 100% RDN + 1% Urea (N_4) produced significantly higher dry matter accumulation but, it was remained at par with application of 100% RDN + 1% Sap (N_2) at 30, 45, 60 DAS and at harvest, 75% RDN + Urea (1%) (N_5). The foliar application of 1% urea or sap twice at branching and flowering stages along with 75 % RDN produced almost comparable growth attributes to those produced by soil application of 100 % RDN only. Thus, it is evident that, foliar application of urea or sap enhanced growth attributes of crop more efficiently than application of full quantity to the soil". Improvement in growth with better nutrient management that favourably modified the plant architecture and consequently dry matter accumulation showed significant positive correction. The results of present studies corroborate with the findings of Ahirwar et al. [10] and Vani et al. [8].

3.2 Effect of Date of Sowing and Nutrient Management on Yield of Sesame

3.2.1 Seed and stalk yield

On the basis of data presented (Table 3), crop sown on 2nd week of March (D_3) found significantly higher seed yield of sesame (778 kg/ha) and stalk yield (1933 kg/ha). The trends found in order of significance of seed and stalk yield was $D_3 \geq D_2 > D_1$. Favorable climatic conditions, harnessing of more solar radiation as evidenced through higher dry matter production and higher values for all the yield contributing traits which in turn has increased the seed yield. The increased vegetative growth results in higher biomass dry matter production, seed and straw yields as explained above again led to significant increase in biological yield. This result is in line with findings of Chongdar et al. [5], Salem [6] and Shubha et al. [11].

Among nutrient management practices, significantly the highest seed yield (791 kg/ha) was recorded when crop fertilized with 100% RDN + 1% Urea (N_4) than other treatments. The trends found in order of significance of seed yield was $N_4 > N_2 > N_5 > N_3 > N_1$. Higher availability of nutrients throughout the crop growth, it led to the increased growth and yield attributes resulting in favourable environment for vegetative as well as reproductive crop growth from initial growth stage to harvest, thus enabling the crop for maximum utilization of nutrients, moisture, light and space, which ultimately led to higher seed and stalk yields of sesame. Similar results were obtained by Singhal et al. [7], Mahajan et al. [12], Vani et al. [8] and Gujjar et al. [9].

Time of sowing and nutrient management failed to exert any significant influence on the harvest index. Similar findings were reported by Chongdar et al. [5] and Lakhran et al. [13].

3.3 Interaction Effect of Date of Sowing and Nutrient Management on Seed Yield

Interaction Date of sowing and nutrient management practices showed a Significant variation with respect to seed yield of sesame (Table 4). Significantly higher seed yield (884 kg/ha) was recorded under the treatment combination D_3N_4 (sowing on 2nd week of March + 100% RDN + 1% Urea), but found at par with treatment combination D_3N_2 (858 kg/ha) and D_2N_4 (820 kg/ha). Significantly the lowest seed yield (611 kg/ha) was registered under treatment combination D_1N_1 (sowing on 2nd week of February + 100% RDN). The higher seed yield with respect to these treatments combinations was might be due to variation in temperature and humidity within crop canopy during the crop growth period. Secondly, nutrient management coupled with increased net photosynthesis on the one hand and greater mobilization of photosynthates towards the reproductive organ on the other hand under optimum sowing date. The enhanced seed yield due to optimum environment had also been reported by Lakhran et al. [13], Shubha et al. [11] and Ozturk et al. [14] [15].

Table 2. Effect of date of sowing and nutrient management on growth parameter of Sesame

Treatments	Plant height (cm)				Dry matter accumulation (g/plant)			
	30 DAS	45 DAS	60 DAS	At harvest	30 DAS	45 DAS	60 DAS	At harvest
Date of sowing (D)								
D_1: 2nd week of February	27.69	67.39	86.36	94.72	1.69	8.63	13.56	15.16
D_2: 4th week of February	30.09	73.21	94.23	102.86	1.75	10.28	14.94	17.41
D_3: 2nd week of March	31.48	73.95	98.21	107.67	1.81	10.85	15.71	18.36
S.Em.±	0.41	1.11	1.55	1.47	0.20	0.17	0.23	0.40
C.D. at 5 %	1.41	3.83	5.38	5.13	0.07	0.59	0.8	1.38
Nutrient management (N)								
N_1: 100 % RDN	28.73	68.19	87.69	96.22	1.68	8.75	13.53	15.33
N_2: 100% RDN + Sap (1%)	30.34	72.74	94.21	105.13	1.79	10.84	15.63	18.03
N_3: 75% RDN + Sap (1%)	29.44	70.65	91.61	98.84	1.73	9.40	14.22	16.08
N_4: 100% RDN + Urea (1%)	30.64	74.27	98.10	107.60	1.80	10.90	15.73	18.46
N_5: 75% RDN + Urea (1%)	29.61	71.72	93.06	100.99	1.75	9.68	14.57	16.98
S.Em.±	0.45	1.04	1.38	1.53	0.026	0.20	0.27	0.40
C.D. at 5 %	1.30	3.00	3.95	4.39	0.07	0.58	0.77	1.16

Table 3. Effect of date of sowing and nutrient management on yield attributes and yield of sesame

Treatments	Seedyield (kg/ha)	Stalk yield (kg/ha)	Harvest index (%)
Date of sowing (D)			
D_1:2nd week of February	638	1766	26.62
D_2:4th week of February	750	1864	28.55
D_3:2ndweek of March	778	1933	28.66
S.Em.±	17	35	0.73
C.D. at 5 %	59	120	NS
Nutrient management (N)			
N_1: 100 % RDN	673	1768	27.25
N_2:100% RDN+Sap (1%)	752	1938	27.93
N_3:75% RDN + Sap (1%)	694	1805	27.81
N_4:100% RDN + Urea (1%)	791	1943	28.89
N_5:75% RDN+Urea (1%)	699	1817	27.83
S.Em.±	13	42	0.65
C.D. at 5 %	38	121	NS

Table 4. Seed yield as influenced by interaction of sowing dates and nutrient management

Seed yield (kg/ha)			
Treatments	**D_1**	**D_2**	**D_3**
N_1	611	709	700
N_2	638	761	858
N_3	629	738	716
N_4	670	820	884
N_5	641	723	731
S.Em.±	23		
C.D. at 5 %	66		

4. CONCLUSION

It was concluded that the sesame crop sown during fourth week of February to second week of March along with 100% RDN +1% spray of either urea or Novel banana pseudo stem sap (at branching and flowering) increased the growth and yield of summer sesame.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Salmasi SZ, Golez KG, Moghbeli S. Effect of sowing date and limited irrigation on the seed yield and quality of dill (*Anthem grayeolens* L.). Turkish Journal of Agriculture and Forestry. 2006;30:281-286.
2. Dinda NK, Ray M, Sarkar P. Effect of sowing date vis-a-vis variety of rapeseed and mustard on growth, yield and aphid infestation in gengetic plain of West Bengal. The Ecoscan. 2015; 9(1&2):21-24.
3. Sharma P, Sardana V, Singh SK. Dry matter partitioning and source sink relationship as influence by foliar sprays in groundnut. The Bioscan. 2013;8(4):1171-1176.
4. Salunke JR. Feasibility of using banana pseudo-stem sap as liquid fertilizer in onion under drip irrigation. Thesis Ph.D., Soil and Water Management Department, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India; 2010.
5. Chongdar S, Singharoy A, Saha A, Chhetri B. Perfomance of summer sesame (*Sesamum indicum* L.) cultivars under varying dates of sowing in prevailing agro-climatic condition of North Bengal. Academic Journals. 2015;10(12):411-420.
6. Salem EMM. Effect of sowing dates and sulphur levels on some sesame (*Sesamum indicum* L.) cultivars under new valley conditions. Egyptian Journal of Desert Research. 2016;66(1):17-34.
7. Singhal VK, Patel GG, Patel DH, Kumar U, Saini LK. Effect of foliar application of water soluble fertilizers on growth, yield and economics of vegetable cowpea production. The Ecoscan. 2015;7:79-83.
8. Vani KP, Rekha KB, Divya G, Nalini N. Perfomance of summer sesamum (*Sesamum indicum* L.) under integrated nutrient management. Journal of Pharmacognosy and Phytochemistry. 2017;6(5):1308-1310.
9. Gujjar PB, Prajapati DR, Patel KH, Baldaniya MJ, Thanki PM, Patel AM. Effect of integrated nutrient management on growth attributes, yield attributes and yield of summer sesame (*Sesamum indicum* L.). AGRES- An international e. Journal. 2018; 7(2):306-309.
10. Ahirwar k, Panda S, Jyotishi A. Optimisation of sesame (*Sesamum indicum* L.) production through integrated nutrient management. International Journel of Current Microbiology and Applied Sciences. 2017;6(11):1701-1707.
11. Shubha GAK, Salim M, Anwar MP. Date of sowing and nitrogen fertilization effect on sesame. Journal of Agroforesty and Environment. 2017;1(1):1-6.
12. Mahajan HS, Patil YG, Hirwe NA, Patil TR, Deshmukh MR. Effect of foliar nutrition of urea and diammonium phosphate on seed yield and economics of sesame (*Sesamum indicum* L.) under rainfed situation. International Journal of Agricultural Sciences. 2016;12(1):101-105.
13. Lakhran H, Sadhu AC, Kumavat S. Quality and yield potential of summer sesame (*Sesamum indicum* L.) as influenced by sowing time and nutrient management in middle Gujarat. The Bioscan. 2015; 12(1):1409-1411.
14. Ozturk E, Polat T, Sezek M. The effect of sowing date and nitrogen fertilizer form on growth, yield and yield components in sunflower. Turkish Journal of Field Crops. 2017;22(1):143-151.
15. Chaudhri Karunaben, HH Patel, Bhagariya Sejalben Gulabbhai. Effect of date of sowing and nutrient management in summer sesame (*Sesamum indicum* L.) under south Gujarat condition. Int. J. Curr. Microbiol. App. Sci. 2022;11(07):68-78.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/113729