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Effect of Date of Sowing and Nutrient Management in Summer Sesame (*Sesamum indicum* L.) under South Gujarat Condition

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A B S T R A C T

A field experiment entitled "Effect of date of sowing and nutrient management in summer sesame (*Sesamum indicum* L.) under south Gujarat condition" was carried out at College Farm, Navsari Agricultural University, Navsari during summer 2019. The experiment consisting 15 treatment combinations comprising of 3 sowing dates *viz*. D_1: 2nd week of February, D_2: 4th week of February, D_3: 2nd week of March and 5 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%), N_5: 75% RDN + Urea (1%) were treated in a split plot design with 4 replications. Amongst sowing dates, crop sown at 2nd week of March (D_3) registered significantly higher growth attributes, yield attributes, seed yield (778 kg/ha), stalk yield (1933 kg/ha), oil yield and nutrients uptake by seed and stalk. Amongst nutrient management, crop was fertilized with 100% RDN+1% Urea (N_4) observed significantly higher growth attributes, yield attributes, stalk yield (1943 kg/ha), oil yield and nutrients uptake by seed and stalk. Significantly the highest seed yield (791 kg/ha) was recorded with 100% RDN+1% Urea (N_4).

Introduction

Oilseeds are backbone of agricultural economy of India since long and considered as the second largest agricultural commodity after cereals. With an annual average yield of about 29 million tons, India stands as fourth leading oilseeds producing countries, next only to the USA, China and Brazil. It is used in medicines and pharmaceuticals industries, bio-diesel, pet foods and component of many other products. In India, sesame occupies about 15.8 lakh hectares area with annual production of 7.55 lakh tones having an average productivity of 478 kg/ha. In Gujarat, it occupies about 1.23 lakh hectares area with annual production of 0.73 lakh tones having an average productivity of 591 kg/ha (Anonymous,

2017-18). Sesame is an important oilseed crop which is cultivated under different agro climatic regions of India, because of its fast growth rate, short duration, less water requirement and wide adaptability under varying soil type. It is widely preferred for its qualities of high drought tolerance and highest oil content in the seeds.

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. By selecting appropriate sowing date, different stages of plant growth with environmental conditions adapted that increase the efficiency of photosynthesis, thus assimilates stored seeds is desirable (Erhart *et al.*, 2005). Sesame can be cultivated in sub-optimal conditions, mainly during February to May in summer. Differential response of varieties to sowing dates showed that the yield of sesame was decreased with delay in sowing beyond third week of July (Mahdi *et al.,* 2007).

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 (Mian *et al.,* 2011). 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 (Sharma *et al.,* 2013). 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 pseudostem. 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 (Akhila *et al.,* 2017).

Materials and Methods

A field experiment was conducted on plot no. B-12, at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer season of 2019. The soil of experimental field was low in available nitrogen (163.07 kg/ha, Alkaline $KMnO_4$ method), medium in available phosphorus (29.94 kg/ha, Olesen's method) high in available potassium (435.56 kg/ha, Flame photometric method) and clayey in texture. The soil was slightly alkaline in reaction with normal electrical conductivity. The experiment included three sowing dates viz., D_1: 2nd week of February, D_2: 4th week of February and D_3: 2nd week of March and 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%) with fifteen treatments combination in split plot design with four replication.

Sesame variety Guj. 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. The NAUROJI novel organic liquid fertilizer of banana pseudostem sap having macro and micro nutrients present *viz*. N (0.79-1.07%), P (0.0270-0.02745%), K (0.16-0.19), Ca (0.033-

0.045), Mg (0.097-1.07), S (0.013-0.017), Mn (13.45 ppm), Cu (0.83 ppm), Zn (4.44 ppm) and Fe (44.85 ppm). Data on different aspects of sesame crop were subjected to statistical analysis as per the procedure of Split Plot Design (Panse and Sukhatme, 1985).

Results and Discussion

Sowing time

Growth attributes

The plant height of sesame was found significant at all growth stages. The maximum plant height (107.67 cm) at harvest was recorded when crop sown on Second week of March (D_3) being at par with Fourth week of February (D_2). The significantly lowest plant height (94.72 cm) at harvest was registered when crop sown on second week of February (D_1). 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.

Similar results were reported by Ghosh (2000); Chongdar *et al.*, (2015) and Salem (2016). The data of dry matter accumulation was significantly influenced by different sowing dates. Sesame sown at second week of March (D_3) registered significantly higher dry matter accumulation (18.36 g/plant) at harvest but found at par with sowing at fourth week of February (D_2). Whereas, significantly the lowest dry matter accumulation (15.16 g/plant) at harvest was recorded when sesame sown at second week of February (D_1). It might be due to variation in temperature and humidity within the crop canopy that increased the plant height and ultimately increasing the dry matter production. The results are close conformity with those of Ghosh (2000) and Chongdar *et al.*, (2015).

Yield attributes and yield

Crop sown at 2nd week of March (D_3) recorded significantly higher number of capsules/plant (58.38), seeds/capsule (62.02), seed yield (778 kg/ha) and stalk yield (1933 kg/ha) but, found at par with crop sown at 4th week of February (D_2). The trends found in order of significance of seed yield was $D_3 \geq D_2 > D_1$.

Sowing dates did not show any significant effect on test weight and harvest index. The higher seed yield under sowing on 2nd week of March may be attributed to 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. This result is in line with findings of Sarkar *et al.*, (2007); Chongdar *et al.*, (2015); Salem (2016) and Shubha *et al.*, (2017).

Oil content, nutrient content and uptake of sesame

Crop sown on 2nd week of March (D_3) gave significantly higher oil yield (370 kg/ha) but, found at par with crop sown on 4th week of February (D_2). Higher oil yield with crop sown on 2nd week of March (D_3) might be due to higher seed yield obtained under these treatments. The results are in close agreement with observations of Ghosh (2000) and Salem (2016). Nitrogen, Phosphorus and Potash content in seeds as well stalk after harvest of sesame as influenced due to different sowing date were found non-significant.

Nitrogen (13.58 and 8.89 kg/ha, respectively), Phosphorus (3.54 and 3.50 kg/ha, respectively) and Potash (4.76 and 26.53 kg/ha, respectively) uptake by seed and stalk was found significantly higher when crop sown on 2nd week of March (D_3) but, found at par with crop sown on 4th week of February (D_2). These results are in accordance with those reported by Ghosh (2000) and Lakhran *et al.*, (2015).

Economics

Highest net realization of 75217 ₹/ha and benefit cost ratio of 2.70 was recorded with crop sown on 2nd week of March (D_3) and it was closely followed by 4th week of February (D_2). Increase in profitability mainly due to higher seed and stalk yields. Similar results were obtained by Kumar and Kumavat (2014) and Lakhran *et al.,* (2015).

Nutrient management

Growth attributes

Maximum plant height at harvest (107.60 cm) was observed when sesame was fertilized with 100% RDN + Urea (1%) (N_4) which was statistically at par with 100% RDN + Sap (1%) (N_2). Moreover, the minimum plant height (96.22 cm) when sesame was fertilized with 100% RDN. 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 Babajide and Oyeleke (2014); Singhal *et al.,* (2015); Thakur *et al.,* (2015); Vani *et al.,* (2017) and Gujjar *et al.,* (2018). Application of 100% RDN + 1% Urea (N_4) produced significantly higher dry matter accumulation (18.46 g/plant) at harvest but, it was remained at par with application of 100% RDN + 1% Sap (N_2).

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. The results of present studies corroborate with the findings of Ahirwar *et al.,* (2017) and Vani *et al.,* (2017).

Yield attributes and yield

Application of 100% RDN + 1% Urea (N_4) produced significantly higher number of capsules/plant (58.45) and seeds/capsule (62.15) but, it was remained at par with 100% RDN + 1% Sap (N_2). The treatment 100 % RDN (N_1) recorded significantly the lowest number of capsules/plant (53.87) and number of seeds/capsule (56.50) than rest of the other treatments. The superiority in yield attributes due to foliar spray fertilizer supplemented with RDN over 100 % RDN alone attributed mainly due to effect of additional quantity of nitrogen fertilizer as per need by the crop. Thus, it could be concluded that the present recommended dose was not enough to meet the nutrient requirement of sesame under existing agro-climatic condition. The results are in close conformity with those of Malik *et al.,* (2003); Reddy *et al.,* (2005); Singhal *et al.,* (2015); Mahajan *et al.,* (2016); Shubha *et al.,* (2017) and Gujjar *et al.,* (2018). Significantly the highest seed yield (791 kg/ha) was recorded when crop fertilized with 100% RDN + 1% Urea (N_4) than all other treatments.

The trends found in order of significance of seed yield was $N_4 > N_2 > N_5 > N_3 > N_1$. Significantly higher stalk yield (1943 kg/ha) was recorded when crop fertilized with 100% RDN + 1% Urea (N_4), but remained at par with 100% RDN + 1% Sap (N_2).

The seed and stalk yields were higher with application of 100% RDN + 1% Urea (N_4) due to the 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 consequently caused significant increase in photosynthesis and dry matter accumulation, which ultimately led to higher seed and stalk yields of sesame. Similar results were obtained by Nakhlawy and Shaheen (2009); Singhal *et al.,* (2015); Mahajan *et al.,* (2016); Shubha *et al.,* (2017); Vani *et al.,* (2017) and Gujjar *et al.,* (2018).

Table.1 Growth attributes, yield attributes, yield and economics as influenced by sowing dates and nutrient management

Treatments	Plant height (cm) at harvest	Dry matter (g/plant) at harvest	Number of capsules/ Plant	Number of seeds/ capsule	Test weight (g)	Seed yield (kg/ha)	Stalk yield (kg/ha)	Harvest index (%)	Total cost (₹/ha)	Gross realization(₹/ha)	Net realization(₹/ha)	BCR
Main plot												
Date of sowing (D)												
D_1:2nd week of February	94.72	15.16	53.84	56.38	3.39	638	1766	26.62	27856	84706	56850	2.04
D_2:4th week of February	102.86	17.41	56.17	59.35	3.43	750	1864	28.55	27856	99364	71508	2.57
D_3:2ndweek of March	107.67	18.36	58.38	62.02	3.47	778	1933	28.66	27856	103073	75217	2.70
S.Em.±	1.47	0.40	0.87	0.82	0.03	17	35	0.73	-	-	-	-
C.D. at 5 %	5.13	1.38	3.00	2.85	NS	59	120	NS	-	-	-	-
CV %	6.52	10.54	6.91	6.21	4.18	10.60	8.33	11.67	-	-	-	-
Sub plot												
Nutrient management (N)												
N_1: 100 % RDN	96.22	15.33	53.87	56.50	3.38	673	1768	27.25	28501	89258	60757	2.13
N_2:100% RDN+Sap (1%)	105.13	18.03	57.07	60.26	3.48	752	1938	27.93	30417	99698	69281	2.28
N_3:75% RDN + Sap (1%)	98.84	16.08	55.24	58.04	3.39	694	1805	27.81	30255	99025	61770	2.04
N_4:100% RDN + Urea (1%)	107.60	18.46	58.45	62.15	3.50	791	1943	28.89	29276	104773	75497	2.58
N_5:75% RDN+Urea (1%)	100.99	16.98	56.00	59.3	3.40	699	1817	27.83	29114	92687	63573	2.18
S.Em.±	1.53	0.40	0.83	0.87	0.03	13	42	0.65	-	-	-	-
C.D. at 5 %	4.39	1.16	2.38	2.50	NS	38	121	NS	-	-	-	-
Interaction (D x N)												
S.Em.±	2.65	0.7	1.43	1.51	0.06	23	73	1.13	-	-	-	-
C.D. at 5 %	NS	NS	NS	NS	NS	66	NS	NS	-	-	-	-
C.V %	5.21	8.23	5.11	5.11	3.38	6.37	7.86	8.11	-	-	-	-

Table.1a 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		
C.V %	6.37		

Table.2 Quality, nutrient content and uptake of sesame as influenced by sowing dates and nutrient management

Treatments	Oil content (%)	Oil yield (kg/ha)	Nutrient content (%)						Nutrient uptake (kg/ha)					
			Seed			Stalk			Seed			Stalk		
			N	P	K	N	P	K	N	P	K	N	P	K
Main plot														
Date of sowing (D)														
D1: 2nd week of February	46.89	299	1.71	0.42	0.59	0.43	0.17	1.33	10.93	2.71	3.79	7.60	2.93	23.49
D2: 4th week of February	47.39	355	1.72	0.44	0.60	0.44	0.18	1.35	12.90	3.17	4.49	8.15	3.29	25.13
D3: 2nd week of March	47.54	370	1.75	0.45	0.61	0.46	0.18	1.37	13.58	3.54	4.76	8.89	3.50	26.53
S.Em.±	0.54	6.0	0.01	0.01	0.004	0.01	0.003	0.02	0.33	0.01	0.1	0.16	0.08	0.56
C.D. at 5 %	NS	20	NS	NS	NS	NS	NS	NS	1.15	0.33	0.33	0.56	0.27	1.95
CV %	5.16	7.49	2.97	7.41	3.31	8.74	7.96	5.25	11.91	13.79	9.89	8.87	10.89	10.06
Sub plot														
Nutrient management (N)														
N1: 100 % RDN	46.77	315	1.69	0.42	0.59	0.42	0.16	1.32	11.38	2.85	3.99	7.51	2.98	23.36
N2: 100% RDN + Sap (1%)	47.48	357	1.74	0.44	0.60	0.45	0.18	1.37	13.07	3.24	4.56	8.73	3.45	26.47
N3: 75% RDN + Sap (1%)	47.19	327	1.73	0.43	0.60	0.43	0.17	1.33	12.03	2.98	4.14	7.83	3.08	24.14
N4: 100% RDN + Urea (1%)	47.56	376	1.74	0.45	0.61	0.46	0.18	1.38	13.77	3.52	4.80	8.86	3.58	26.71
N5: 75% RDN + Urea (1%)	47.37	331	1.73	0.44	0.60	0.45	0.17	1.35	12.10	3.09	4.23	8.13	3.13	24.56
S.Em.±	0.55	7.0	0.01	0.01	0.02	0.01	0.005	0.02	0.24	0.09	0.09	0.24	0.12	0.65
C.D. at 5%	NS	21	NS	NS	NS	NS	NS	NS	0.7	0.25	0.26	0.69	0.35	1.87
Interaction (D x N)														
S.Em.±	0.96	13	0.02	0.01	0.01	0.01	0.01	0.01	0.42	0.15	0.16	0.41	0.21	1.13
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V %	4.04	7.61	2.54	6.22	4.01	6.46	10.18	4.01	6.75	9.76	7.47	10.12	13.02	9.01

Oil content, nutrient content and uptake of sesame

Oil content in sesame did not found any significant difference between different nutrient management practices. However, application of 100% RDN + Urea (1%) (N_4) was significantly increase the oil yield of sesame (376 kg/ha) but, remain at par with application of 100% RDN + Sap (1%) (N_2).

Almost closely related finding have been reported by Nakhlawy and Shaheen (2009) and Mahajan *et al.*, (2016). Different nutrient management practices did not show significant difference in Nitrogen, Phosphorus and Potash content in seed and stalk. Application of 100% RDN + Urea (1%) (N_4) recorded significantly higher nitrogen (13.77 and 8.86 kg/ha, respectively), phosphorus (3.52 and 3.58 kg/ha, respectively) and potash (4.80 and 26.71 kg/ha, respectively) uptake by seed and stalk. Which, emphasized that plant vegetative growth, development and nutrient uptakes are influenced by nutrient availability particularly nitrogen, which improved as the rates of application increased. These results are in accordance with those reported by Reddy *et al.*, (2005); Bajajide and Oyeleke (2014); Patel and Raj (2017) and Shamsuzzoha *et al.*, (2019).

Economics

The highest net return of 75497 ₹/ha was recorded with 100% RDN + 1% Urea (N_4) with 2.58 BCR. The minimum net realization 60757 ₹/ha was recorded under 100 % RDN (N_1) with 2.13 BCR. Increase in net return and BCR might be due to higher yields and low cost of cultivation. Similar results were obtained by Singhal *et al.*, (2015); Mahajan *et al.*, (2016) and Akhila *et al.*, (2017).

Interaction (Sowing time x Nutrient management)

The interaction between the sowing dates and nutrient management practices showed significant variation with respect to seed yield of sesame. Significantly maximum seed yield (884 kg/ha) was noticed under D_3N_4 (sowing on 2nd week of March + 100% RDN + 1% Urea) followed by 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 the crop canopy during the crop growth period. The enhanced seed yield due to optimum environment had also been reported by Mandal *et al.*, (2003); Lakhran *et al.*, (2015); Ozturk *et al.*, (2017) and Shubha *et al.*, (2017).

Based on one year field experimentation, it is concluded that sesame crop sown during fourth week of February to second week of March along with 100% RDN +1% spray of either urea or NAUROJI Novel banana pseudostem sap (at branching and flowering) increased the seed yield and net realization of summer sesame in south Gujarat heavy rainfall Agro-ecological situation III (AES-III).

References

Ahirwar, k., Panda, S. and Jyotishi, A. 2017. Optimisation of sesame (*Sesamum indicum* L.) production through integrated nutrient management. *International Journel of Current Microbiology and Applied Sciences* 6(11): 1701-1707.

Akhila, K., Kaswala, A. R., Priyanka and Dubey, P. K. 2017. Effect of liquid fertilizers on growth yield and economics of the green gram (*Vigna radiata*) crop under organic farming. *International Journal of Chemical Studies* 5(6): 809-812.

Anonymous, 2017-18. Annual report. Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India, Krishi Bhavan, New Delhi.

Babajide, P. A., and Oyeleke, O. R. 2014. Evaluation of sesame (*Sesamum indicum* L.)

for optimum nitrogen requirement under usual farmer's practice of basal organic manuring in the savanna Ecoregion of Nigeria. *Journal of Natural Sciences Research* 4(17): 122-132.

Chongdar, S., Singharoy, A., Saha, A., and Chhetri, B. 2015. Performance of summer sesame (*Sesamum indicum* L.) cultivars under varying dates of sowing in prevailing agro-climatic condition of North Bengal. *Academic Journals* 10(12): 411-420.

Erhart, E. W. Hartl and Putz B. 2005. Bio waste compost affects yield, nitrogen supply during the vegetation period and crop quality of agricultural crops. *European Journal of Agron*omy 23: 305-314

Ghosh, K. 2000. Effect of dates of sowing and sources of sulphur on growth and yield of sesame (*Sesamum indicum* L.) Ph.D. Thesis submitted to Bidhan Chandra Krishi viswavidyalaya Mohanpur, Nadia, West Bengal.

Gujjar, P. B., Prajapati, D. R., Patel, K. H., Baldaniya, M. J., Thanki, P. M. and Patel, A. M. 2018. Effect of integrated nutrient management on growth attributes, yield attributes and yield of summer sesame (*Sesamum indicum* L.). *AGRES- An international e. Journal* 7(2): 306-309.

Kumar, R. and Kumawat, N. 2014. Effect of sowing dates, seed rates and integrated nutrition on productivity, profitability and nutrient uptake of summer mungbean in Estern Himalaya. *Archives of Agronomy and Soil Science* 60(9): 1207-1227.

Lakhran, H., Sadhu, A. C. and Kumavat, S. 2015. Quality and yield potential of summer sesame (*Sesamum indicum* L.) as influence by sowing time and nutrient management in middle Gujarat. *The Bioscan* 10(3): 1409-1411.

Mahajan, H. S., Patil, Y. G., Hirwe, N. A., Patil, T. R. and Deshmukh, M. R. 2016. 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* 12(1): 101-105.

Mahdi, A., Amin S. E. M and Ahmed F. G. 2007. Effect of sowing date on the performance of sesame (*Sesamum indicum* L.) genotypes under irrigation conditions in Northern Sudan. African Crop Sciences Conference Proceedings 8: 1943-1946.

Malik, M., Saleem, M. F., Cheema M. A. and Ahmed, S. 2003. Influence of different nitrogen levels on productivity of sesame (*Sesamum indicum* L.) under varying planting pattern. *International Journel of Agriculture and Biology* 5(4): 490-492.

Mandal, B. K., Mandal, B. B., Murmu, N. N., Tudu, B. C. and Khanda, C. M. 2003. Growth and yield of sunflower as influenced by dates of sowing and levels of N, P and K. *Indian Journal of Plant Physiology* 8(1): 103-105.

Mian, M. A. K., Uddin, M. K., Islam, M. R., Sultana, N. A. and Kohinoor, H. 2011. Crop perfomance and estimation of the effective levels of phosphorus in sesame (*Sesamum indicum* L.). *Academic Journel of Plant Sciences* 4(1): 1-5.

Nakhlawy, F. S. and Shaheen, M. A. 2009. Response of seed yield, yield components and oil content to the sesame cultivar and nitrogen fertilizer rate diversity. *JKAU: Meteorology, Environment and Arid Land Agriculture Journal* 20(2): 21-31.

Ozturk, E., Polat, T. and Sezek, M. 2017. The effect of sowing date and nitrogen fertilizer form on growth, yield and yield components in sunflower. *Turkis Journal of Field Crops* 22(1): 143-151.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical mehods for Agricultural Workers. ICAR, New Delhi, pp. 199-200.

Patel, H. A. and Raj, A. D. 2017. Nutrient content as well as uptake of summer sesame as affected by nitrogen, phosphorus and biofertilizer under south Gujarat condition. *International journal of chemical studies* 5(6): 1-4.

Reddy, M. M., Padmaja, B., Rao, L. J. and Radhakrishna, K. V. 2005. Effect of foliar

spray of urea on nitrogen uptake and yield of urd bean (*Vigna mungo* L.) under rainfed conditions. *Indian Journal of Dryland Agricultural Research and Development* 20(2): 151-154.

Salem E. M. M. 2016. Effect of sowing dates and sulphur levels on some sesame (*Sesamum indicum* L.) cultivars under new valley conditions. *Egyptian Journal of Desert Research* 66(1): 17-34.

Sarkar, A. M. N., Salim, M., Islam, N. and Rahman, M. M. 2007. Effect of sowing date and time of harvesting of the yield and yield contributing characters of sesame (*Sesamum indicum* L.) seed. *International Journal of Sustainable Crop Production* 2(6): 31-35.

Shamsuzzoha, M., Ahan, M. A. J, Mastofa, M., Afrose, R., Sarker, S and Kundu, P. K. 2019. Effect of nitrogen and boron on available nutrients in sesame (*Sesamum indicum* L.) and harvested soil. *Research in Agricultural Livestock and Fisheries* 6(2): 203-213.

Sharma, P., Sardana, V. and Singh, S. K. 2013. Dry matter partitioning and source sink relationship as influence by foliar sprays in groundnut. *The Bioscan* 8(4): 1171-1176.

Shubha, G. A. K., Salim, M. and Anwar, M. P. 2017. Date of sowing and nitrogen fertilization effect on sesame. *Journal of Agroforesty and Environment* 1(1): 1-6.

Singhal, V. K., Patel, G. G., Patel, D. H., Kumar, U. and Saini, L. K. 2015. Effect of foliar application of water soluble fertilizers on growth, yield and economics of vegetable cowpea production. *The Ecoscan* 7: 79-83.

Thakur, A. K., Pradhan, A., Patel, R. K., Adikant and Kumar, P. 2015. Effect of different nitrogen, phosphorus and potassium levels on sesame (*Sesamum indicum*L.) in bastar plateau of Chhattisgarh. *The Bioscan* 10(3): 1241-1243.

Vani, K. P., Rekha, K. B., Divya, G. and Nalini, N. 2017. Perfomance of summer sesamum (*Sesamum indicum* L.) under integrated nutrient management. *Journal of Pharmacognosy and Phytochemistry* 6(5):1308-138.

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