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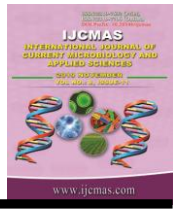

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Response of Sowing Dates and Fertilizer Levels on Growth, Yield and Quality of Sesamum (*Sesamum Indicum* L.)

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A B S T R A C T

A field experiment was conducted at Instructional farm, Department of Agronomy, COA, Parbhani on a clayey soil during *kharif* season of 2018 to find out the effect of with two factors viz., sowing dates [four levels: D_1 (15^{th} June), D_2 (30^{th} June), D_3 (15^{th} July) and D_4 (30^{th} July)] and three fertilizer levels [F_1 (75% RDF), F_2 (100% RDF) and F_3(125% RDF)] with twelve treatments combinations. Each experimental unit was repeated three times. The fertilizer dose of 50:25:00 NPK kg ha^{-1} was applied after sowing. Amongst sowing dates, Crop sown on 15^{th} June recorded significantly higher growth attributes, yield attributes, seed yield (435 kg ha^{-1}), straw yield (1541 kg ha^{-1}), biological yield (1975 kg ha^{-1}). Amongst fertilizer levels, 125 % RDF (F_3) recorded significantly higher growth attributes, yield attributes, seed yield (375 kg ha^{-1}), straw yield (1381 kg ha^{-1}), biological yield (1756 kg ha^{-1}), harvest index (21.36 %). From result it can be concluded that, sowing of sesamum on 15^{th} June and 30^{th} June was found beneficial as compared to other sowing dates. Among the various fertilizer levels the application of fertilizer level 100% RDF was more profitable.

Introduction

Sesamum *(Sesamum indicum* L.) which is known variously as sesamum, til, gingelly, simsim, gergelim etc. is one of the most important oil seed crop grown extensively in India. Sesamum is the oldest indigenous oil plant with longest history of its cultivation in India. Africa has been considered as the center of origin of this crop (Joshi, 1961). It belongs to order Tubiflorae and family Pedaliaceae. Sesamum is having quality food, nutrition, edible oil, biomedicine and health care, all in one. Sesamum has remarkable antioxidant function due to the presence of lignin and tocopherol. The seed is highly rich in quality

protein and essential amino acid especially methionine is considered rejuvenate and anti-adding for human body.

Sowing time of sesame play an important role on its average production for different agro-climatic region which is mostly grown under rain fed conditions. Thus, the rainfall pattern (onset and termination of rainfall and distribution of rainfall) influence the growth and yield of crop. The late onset of monsoon generally delays the sowing resulting in to poor yield. This necessitates finding out suitable sowing time with the consideration to the effect of temperature on plant. Degree days concept based on the idea that plants have a specific temperature requirement for the completion of particular physiological stage will definitely provide ample scope to find the suitability of sowing time.

Fertilizer is one of the most important inputs for successful crop production. A sustainable increase in production can be obtained by using balanced fertilizers. More scientific efforts are needed to increase the productivity of sesamum per unit area and per unit time with soil moisture conservation and optimum fertilizer dose. Therefore, it is necessary to study the behavior of sesamum under various fertilizer levels. The major plant nutrients applied through chemical fertilizers may not be taken up properly by plant roots of crop plants due to poor organic carbon content and water holding capacity of soil. The variability in crop performance arising from different sowing dates is a consequence of changes in the factors of environment in time. This study is therefore carried out to determine the optimum time of sowing and to identify suitable fertilizer levels.

Materials and Methods

A field experiment was conducted during the period of 2018-19 at Experimental Farm of Agronomy at College of Agriculture, Parbhani. The soil was clayey in texture, low in available nitrogen (231 kg ha^{-1}), low in available phosphorus (12.64 kg ha^{-1}), rich in available potash (474 kg ha^{-1}), sulphur (15.25 kg ha^{-1}) and slightly alkaline in reaction. The soil was moderately alkaline in reaction (8.13 pH). In general, weather conditions were favorable for plant growth and no severe pest and diseases noticed during experimentation. The study involved twelve treatment combinations consisting two factors viz., sowing dates [four levels: D_1 (15^{th} June), D_2 (30^{th} June), D_3 (15^{th} July) and D_4 (30^{th} July)] and three fertilizer levels [F_1 (75% RDF), F_2 (100% RDF) and F_3(125% RDF)] with twelve treatments combinations in split plot design with three replications. The Each experimental unit was repeated three times 5.40 m x 4.5 m^2 size in gross plot and in net plot 4.5 x 4.0 m^2.

Sowing was completed as per treatments. The fertilizer dose of 50:25:00 NPK kg ha^{-1} was applied after sowing. The package of recommended practices was adopted to maintain the crop.

Results and Discussion

Effects on growth attributes

Sowing dates

Plant height, number of branches, mean total dry matter $plant^{-1}$, and number of capsules per plant were significantly influenced due to sowing dates.

Amongst the sowing dates, crop sown on 15^{th} June recorded maximum Plant height, number of branches, mean total dry matter $plant^{-1}$, and number of capsules per plant at all growth stages, followed by 15^{th} and 30^{th} July, respectively. The better performance of 15^{th} June may be attributed to its better vegetative growth over 15^{th} and 30^{th} July, respectively.

Fertilizer levels

Fertilizer levels significantly influenced all the growth attributes viz., Plant height, number of branches, mean total dry matter plant^{-1}, and number of capsules per plant at harvest.

The application of 125% RDF recorded more number of branches and dry matter accumulation (cm^2) which was found at par with the application of 100 % RDF.

The significantly lowest number of branches, dry matter production and number of capsules were recorded by application of 75% RDF at all stages of the crop growth. Application of 125% RDF was found significantly effective over 100% RDF and 75% RDF in increasing growth attribute of sesamum. Similar results were found by Rao *et al.,* (1993), Paramasivam *et al.,* (2003), Barik and Fulimali (2011) and Tripathy and Bastia (2012).

Effect on Yield attributes and yield

Sowing dates

Various yield attributes viz., number of capsuls plant^{-1}, weight of capsuls plant^{-1}, weight seed yield plant^{-1} and test weight were significantly influenced due to four sowing dates under study, except number of seeds per pod which was not significantly influenced due to varieties. Crop sown on 15th June recorded significantly maximum number of capsules plant^{-1}, weight of capsules plant^{-1}, weight seed yield plant^{-1} and test weight than 15th and 30th July, respectively. The data showed that the sowing date of 15th June (D_1) recorded significantly higher seed yield (435 kg ha^{-1}) than crop sown on 15th and 30th July, but it was found at par with the sowing date of 30th June (D_2) (405 kg ha^{-1}).

Fertilizer levels

The application of 125% RDF and 100 % RDF produced significantly higher number of capsuls plant^{-1}, weight of capsuls plant^{-1}, weight seed yield plant^{-1} and test weight than 75% RDF. The application of 75% RDF recorded significantly lowest number of branches plant^{-1} (1.55), than fertilizer levels.

The application of 125% RDF recorded significantly higher seed yield (375 kg ha^{-1}) which was found at par with the application of 100 % RDF (356 kg ha^{-1}). Application of 75% RDF (312 kg ha^{-1}) recorded significantly lowest seed yield. Such type of results are found by Deshmukh *et al.,* (2002), Haruna (2011), Sawant *et al.,* (2013) and Kashani *et al.,* (2015).

Effect on quality

Sowing dates

Results revealed (Table 1) that different sowing dates did not show their significant influence on oil content (%) in the seeds. However, oil yield (Table 2) was significantly influenced due to different sowing dates. Significantly higher oil yield (215.64 kg ha^{-1}) was observed under sowing date of 15th June (D_1) and it was found at par with sowing date of 30th June (D_2) (198.75 kg ha^{-1}). Similar results were reported by Amanullah *et al.,* (2014), Mshelia *et al.,* (2014) and Patel *et al.,* (2010).

Fertilizer levels

The significantly highest oil yield (182.30 kg ha^{-1}) was observed under application of 125 % RDF, while the significantly lowest oil yield (151.81kg ha$^{-1)}$ was registered under the treatment of 75 % RDF.

Table.1 Growth and yield attributes of sesamum at harvest as influenced by various sowing dates and fertilizer levels

Treatments	Plant height (cm)	Number of branches plant^{-1}	Dry matter production (g plant^{-1})	Number of capsuls plant^{-1}	Weight of capsule plant^{-1} (g)	Wt. of seed plant^{-1} (gm)	Test weight (gm)
Sowing dates (04)							
D_1 (15th June)	115.44	3.91	22.05	26.11	7.62	2.52	2.92
D_2 (30th June)	108.88	3.60	19.44	24.22	7.22	2.20	2.81
D_3(15thJuly)	98.00	3.28	15.05	20.00	6.51	1.76	2.71
D_4 (30th July)	90.00	2.78	12.66	17.33	5.59	1.38	2.62
SE ±	2.28	0.094	0.76	0.64	0.19	0.10	0.17
CD at 5 %	7.89	0.326	2.62	2.21	0.67	0.35	NS
fertilizer levels (03)							
F_1 (75%RDF)	94.00	3.05	14.20	19.67	6.30	1.61	2.54
F_2(100%RDF)	104.66	3.49	17.83	22.16	6.84	2.06	2.80
F_3(125%RDF)	110.58	3.68	19.87	23.91	7.06	2.22	2.95
SE±	2.44	0.102	0.72	0.65	0.16	0.08	0.12
CD at 5%	7.32	0.305	2.16	1.95	0.49	0.22	NS
Interaction							
SE ±	4.88	0.203	1.44	1.29	0.33	0.14	0.24
CD at 5 %	NS	NS	NS	NS	NS	NS	NS
General Mean	**103.08**	**3.40**	**17.30**	**21.91**	**6.73**	**1.96**	**2.76**

Table.2 Yield and quality of sesamum at harvest as influenced by various sowing dates and fertilizer levels

Treatments	Seed yield (kg ha $^{-1}$)	Straw yield (kg ha $^{-1}$)	Biological yield (kg ha $^{-1}$)	Harvest Index (%)	Oil content (%)	Protein content (%)
Sowing dates						
D_1 (15th June)	435	1541	1975	22.02	49.61	21.36
D_2 (30th June)	405	1468	1873	21.62	49.03	21.10
D_3(15thJuly)	312	1205	1517	20.56	47.63	20.54
D_4 (30th July)	239	961	1201	19.90	47.31	20.20
SE±	11.69	38.79	44.22	-	0.51	0.25
CD at 5 %	40.47	134.24	153.02	-	NS	NS
Fertilizer levels						
F_1 (75%RDF)	312	1181	1494	20.88	48.34	20.67
F_2(100%RDF)	356	1319	1675	21.25	48.41	20.82
F_3(125%RDF)	375	1381	1756	21.36	48.44	20.90
SE±	8.08	43.02	43.72	-	0.44	0.22
CD at 5%	24.23	128.97	131.09	-	NS	NS
Interaction (D X F)				-		
SE±	16.16	86.04	87.45	-	0.89	0.45
CD at 5 %	48.47	NS	NS	-	NS	NS
GM	**347.6**	**1293.80**	**1641.50**	**-**	**48.40**	**20.80**

Fertilizer level 125 % RDF was found at par with 100 % RDF. The significantly highest protein yield (78.86 kg ha^{-1}) was observed under application of 125 % RDF, while the significantly lowest oil yield (65.15 kg $ha^{-1)}$ was registered under the treatment of 75 % RDF. Similar results were reported by Thanki *et al.*, (2004) and Tripathy and Bastia (2012).

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