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Optimizing Sowing Window for Sesame

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ABSTRACT

A trial was conducted to identify optimum sowing time for sesame in North Coastal Zone of Andhra Pradesh under irrigated conditions at Regional Agricultural Research Station, Anakapalle during rabi 2020-21 and 2021-22. The treatments consisted of two varieties of Sesame as main plots and six sowing dates in split plot design replicated thrice. The results of the trial revealed that optimum sowing time for sowing of Sesame under irrigated conditions in North Coastal Zone is second fortnight of December. Among the varieties, brown seeded variety (YLM 66) gave significantly higher seed yield than white seeded Variety (Swetha til) and was found suitable to NC zone. For brown seeded Sesame, YLM 66 sown during first fortnight of December to first fortnight of January gave higher seed yields as compared to other dates of sowing. For white seeded sesame, sowing during second fortnight of December gave higher seed yield. Delay in sowing beyond first fortnight of January for brown seeded sesame and beyond second fortnight of December for white seeded sesame reduced the seed yield significantly.

Key words: *Sesame, Seed yield, Sowing dates, Varieties*

Introduction

Among the major oil seeds produced in India, sesame is one of the oldest and the third most important crop. The sesame yields have been influenced by the date of sowing and variety used, due to the occurrence of different pests and diseases and varying temperatures due to climatic change. In Andhra Pradesh, with special reference to North Coastal agroclimatic zone, the crop is grown mostly as rainfed in *kharif* while under irrigation during rabi season. The current recommended dates of sesame sowing were worked earlier purely specific to sesame crop but not based on cropping system in which sowing dates of sesame is varied based on the varietal duration of the paddy. Hence, farmers in most cases are unable to adopt sesame sowing dates as per the recommendation given earlier and yields in farmer's fields are being affected as crop is highly photosensitive. Further, suitable dates sowing for white seeded sesame is not worked out earlier in North Coastal Zone of Andhra Pradesh. Hence, this trial was taken up to work out optimum sowing window for sesame in North Coastal Zone of Andhra Pradesh.

Materials and Methods

A field trial was taken up to optimize the sowing window for sesame in North Coastal Zone of Andhra Pradesh under irrigated conditions for two years during *rabi* 2020-21 and 2021-22. The treatments consisted of twelve combinations with two sesame varieties as main plots V_1 – YLM 66, V_2 – Swetha til and six sowing dates D_1 – 1st F.N of December, D_2 – 2nd F.N of December, D_3 – 1st F.N of January, D_4 – 2nd F.N of January, D_5 – 1st F.N of February and D_6 – 2nd F.N of February in split plot de-

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sign replicated thrice on red sandy clay loams. The weather during the crop growth period of 2020-21 was normal with 37.6mm rainfall in 3 rainy days with mean minimum temperature of 19.64^{0}C and mean maximum temperature of 32.86^{0}C. The weather during the crop growth period of 2021-22 was also normal with 16.3 mm rainfall in one rainy day with mean minimum temperature of 19.36^{0}C and mean maximum temperature of 32.45^{0}C.

Thorough land preparation was done twice with cultivator followed levelling and planking. The crop was line sown at 30 cm X 15 cm spacing in 4.5m X 3.6 m plots. A fertilizer dose of 40-20-20 kg N, P and K /ha was applied to the crop. Pre emergence application of Pendimethalin @ 600 ml/ac was sprayed in 200 litres spray volume within 3 days after sowing for control of weeds followed by one hand weeding at 30 DAS. Two irrigations were given to the crop at 30 DAS and before flowering. Need based plant protection sprays were given for management of sucking pests and phyllody at early stages of crop growth and for powdery mildew at later stages. Data was recorded on growth and yield parameters and were analyzed as per the statical procedures (Gomez and Gomez, 1984).

Results and Discussion

Days to 50 % flowering: Study during both the years of experimentation and from the pooled mean it was observed that among the both the varieties, white seeded variety Swetha til registered significantly early flowering than the brown seeded variety YLM 66 (Table 1). With regard to days of 50% flowering was recorded earliest with sesame sown during second fortnight of December and was comparable with sowing at first fortnight of December and was significantly earlier than all other sowing dates. The interaction of varieties and different dates of sowing was however non-significant with regard to this parameter. Several researchers also reported early flowering with regard to white seeded sesame (Saju Adhikary *et al.,* 2021) and second fortnight of December which clearly indicted the adoption and suitability of white seeded sesame when temperatures were low in the month of December in comparison to brown seeded types of sesame.

Days to maturity: During both the years of experimentation andfrom pooled mean it was observed that among the both the varieties, white seeded variety Swetha til registered significantly early maturity than the brown seeded variety YLM 66. However, days to maturity did not differ significantly with sesame sown at different sowing windows. The interaction of varieties and different dates of sowing was however non-significant with regard to this parameter. Several researchers also reported early maturity with regard to white seeded sesame and second fortnight of February due to increased temperatures (Saju Adhikary *et al.*, 2021) which reduced the crop duration.

Final plant population: Brown seeded YLM 66 registered significantly higher plant population than

Table 1. Influence of varieties and sowing window on growth parameters of sesame

Treatment	Days to 50 per cent flowering			Days to maturity			Final plant population (No/ha)			Plant height at maturity (cm)		
	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean
Main Plots : Two Sesame Varieties												
V_1: YLM 66	48.56	42.72	45.14	93.78	83.78	88.78	188333	188333	188,333	84.17	88.51	86.34
V_2: Swetha til	42.44	38.28	40.36	89.44	80.06	84.75	175000	175555	175,278	77.56	78.22	77.89
S.E(m)	0.039	0.039	0.039	0.245	0.375	0.293	680.42	2187.22	1416.39	0.353	0.792	0.227
C.D (0.05)	0.26	0.26	0.26	1.61	2.45	1.92	4458	NS	9279	2.31	5.19	1.49
Sub Plots :Six Sowing dates												
D_1: 1st F.N of December	43.67	39.67	41.67	88.67	85.50	87.08	213333	206667	210,000	83.23	83.32	83.27
D_2: 2nd F.N of December	43.00	38.00	40.50	88.00	85.67	86.83	203333	183833	195,833	82.22	78.92	80.57
D_3: 1st F.N of January	43.83	41.33	42.58	89.33	83.67	86.50	191667	203333	197,500	91.65	83.72	87.68
D_4: 2nd F.N of January	45.67	41.67	43.67	92.00	83.67	87.83	173333	171667	172,500	88.08	72.20	80.14
D_5: 1st F.N of February	45.67	41.67	43.67	95.33	79.00	87.17	170000	163333	166,667	74.18	92.98	83.58
D_6: 2nd F.N of February	48.17	40.67	44.42	96.33	74.00	85.17	138333	158333	148,333	65.82	89.03	77.42
S.E(m)	0.478	0.478	0.478	0.609	0.863	0.658	3415.65	3442.65	2509.24	0.911	3.435	1.767
C.D (0.05)	1.42	1.42	1.42	1.81	2.56	NS	10147	10227	7454	2.71	10.21	5.25
Interaction	NS	2.02	NS	2.83	NS	NS	NS	17862	NS	NS	NS	7.51

thewhite seeded variety Swetha til. Similarly, final plant population was the highest with first date of sowing i.e., December first fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was however non-significant with regard to this parameter. Several researchers also reported higher plant stand with brown seeded sesame and first fortnight of December which indicated that the plant stand reduced with delay in sowing which might be attributed to lack of sufficient soil moisture, increased pest and disease infestation and increased mean temperature during crop growth period (Saju Adhikary *et al.,* 2021). Several researchers also reported highest plant stand with regard to brown seeded sesame over white seeded types and decreased population with late sowing.

Plant height at maturity: Brown seeded YLM 66 registered significantly higher plant height than the white seeded variety Swetha til. Similarly, final plant stand was the highest with third date of sowing i.e., January first fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was however significant with regard to this parameter. Several researchers also reported higher plant height with brown seeded sesame and first fortnight of January which indicated that the plant stand reduced with delay in sowing which might be attributed increased soil temperatures and pest and disease infestation and increased mean temperature during crop growth period. Knag-Bo Shim *et al.* (2006) concluded that the plant height was significantly decreased as sowing dates were delayed. Highest plant height with regard to brown seeded sesame over white seeded types and decreased plant stature with late sowing was also reported by Sivagamy and Rammohan, 2013.

No. of branches per plant: Brown seeded YLM 66 registered significantly higher branches per plant than the white seeded variety Swetha til. Similarly, branches per plant was the highest with second date of sowing i.e., December second fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was however not significant with regard to this parameter. Several researchers also reported higher number of branches with brown seeded sesame and second fortnight of December which indicated that the branches per plant reduced with delay in sowing which might be attributed increased soil temperatures and pest and disease infestation and increased mean temperature during crop growth period. Several researchers also reported highest branches per plant with regard to brown seeded sesame over white seeded types and decreased branches per plant with late sowing (Saju Adhikary *et al.,* 2021). Delay in planting decreases

Table 2. Influence of varieties and sowing window on yield parameters and yield of Sesame

Treatment	No. of branches/ plant			No. of capsules/ plant			1000 seed weight (g)			Seed Yield (kg/ha)		
	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean	2020-21	2021-22	Pooled mean
Main Plots : Two Sesame Varieties												
V_1: YLM 66	2.63	2.54	2.59	34.31	80.11	57.21	2.827	2.905	2.866	736	763	750
V_2: Swetha til	2.37	1.85	2.11	31.41	79.67	55.54	2.775	2.849	2.812	633	610	622
S.E(m)	0.128	0.134	0.053	0.845	1.561	1.17	0.006	0.003	0.005	8.067	10.856	6.607
C.D (0.05)	NS	NS	0.35	NS	NS	NS	0.040	0.038	0.033	53	71	43
Sub Plots :Six Sowing dates												
D_1: 1st F.N of December	3.53	2.38	2.96	35.90	64.00	49.95	2.905	2.962	2.933	851	867	859
D_2: 2nd F.N of December	3.31	3.13	3.22	35.20	123.33	79.27	2.848	2.922	2.885	873	921	897
D_3: 1st F.N of January	2.33	2.65	2.49	34.03	90.33	62.18	2.833	2.903	2.868	848	846	847
D_4: 2nd F.N of January	2.20	2.18	2.19	34.93	78.67	56.80	2.762	2.827	2.794	608	681	695
D_5: 1st F.N of February	1.64	1.77	1.71	27.37	67.83	47.60	2.723	2.835	2.779	382	437	409
D_6: 2nd F.N of February	1.98	1.07	1.53	29.73	55.17	42.45	2.735	2.813	2.774	545	367	456
S.E(m)	0.528	0.219	0.313	1.254	9.42	4.55	0.014	0.018	0.014	17.386	24.527	15.570
C.D (0.05)	NS	0.65	0.93	3.72	28.00	13.52	0.043	0.054	0.043	52	73	46
Interaction DOSÕ V	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	116	73
Interaction V Õ DOS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	112	70

the number of branches per plant and number of capsules per plant according to Ahmed *et al.* (2009).

No. of Capsules per plant: Brown seeded YLM 66 and the white seeded variety Swetha til did not differ significantly with respect to capsules per plant. However, capsules per plant were the highest with second date of sowing i.e., December second fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was not significant with regard to this parameter. Several researchers also reported that capsule number did not vary much with different sesame varieties but was influenced by date of sowing which indicated that the capsule number reduced with delay in sowing which might be attributed increased soil temperatures and pest and disease infestation and increased mean temperature during crop growth period. Similar studies by Muhammad Tahir *et al.* (2012) and Sivagamy and Rammohan, 2013 also revealed that early sowing produced significantly more number of capsules per plant than late sowing.

Thousand seed weight: Brown seeded YLM 66 registered significantly higher thousand seed weight than the white seeded variety Swetha til. Similarly, 1000 seed weight was the highest with first date of sowing i.e., December first fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was however notsignificant with regard to this parameter. Several researchers also reported higher number of 1000 seed weight with brown seeded sesame and first fortnight of December which indicated that the 100 seed weight reduced with delay in sowing which might be attributed decreased seed weight. Several researchers also reported highest thousand seed weight with regard to brown seeded sesame over white seeded types and decreased thousand seed weight with late sowing (Sivagamy and Rammohan, 2013).

Seed yield: Brown seeded YLM 66 registered significantly highest seed yield than the white seeded variety Swetha til. Similarly, seed yield was the highest with second date of sowing i.e., December second fortnight and reduced gradually upto second fortnight of February. The interaction of varieties and different dates of sowing was significant with regard to this parameter. Maximum seed yield was obtained with combination of YLM 66 sown during first fortnight of January and it was on par with YLM 66 sown during second fortnight of December and YLM 66 sown during first fortnight of December. The higher seed yield with December sowings may be attributed to favorable climatic conditions, harnessing of more solar radiation as evidenced through higher values for the entire yield contributing traits, which in turn has increased the seed yields. Several researchers also reported higher seed yield with brown seeded sesame and second fortnight of December which indicated that the plant stand reduced with delay in sowing which might be attributed decreased seed weight. Several researchers also reported highest seed yield with regard to brown seeded sesame over white seeded types and decreased thousand seed weight with late sowing (Saju Adhikary *et al.*, 2021 and Sivagamy and Rammohan, 2013). According to Swami Chaitanya *et al.* (2022) among the factors necessary for successful production of crop, time of sowing can have a major effect on final size of plants and the yield. Optimum sowing time may vary from one variety to another and also from one region to another due to variation of agro-ecological conditions. Yield decreases progressively with the delay in planting from optimum time of sowing. This result is in line with the findings of Sarkar *et al.* (2007); Sivagamy and Rammohan (2013).

Table 3. Pooled Seed Yield (Kg/ha) of Sesame as influenced by varieties and sowing dates

V X DOS	D1	D2	D3	D4	D5	D6	Mean
V1-YLM 66	918	970	972	689	465	483	750
V2-Swetha til	800	825	722	600	354	429	622
Mean	859	897	847	645	409	456	
Factors	C.D.	SE(d)	SE(m)				
Varieties (V)	43	9.344	6.607				
Dates of Sowing (D)	46	22.020	15.570				
D X V	73	31.140	16.185				
V X D	70	29.924	21.159				

Table 4. Influence of varieties and sowing window on economics of sesame

Treatment	Gross Returns (Rs./ha)			B:C Ratio		
	2020-21	2021-22	Mean	2020-21	2021-22	Mean
Main Plots : Two Sesame Varieties						
V_1: YLM 66	50458	56241	53099	1.68	1.79	1.727
V_2: Swetha til	43406	44572	43989	1.44	1.42	1.432
Sub Plots :Six Sowing dates						
D_1: 1st F.N of December	58359	64876	60866	1.94	2.07	1.98
D_2: 2nd F.N of December	59854	67312	63583	1.99	2.14	2.07
D_3: 1st F.N of January	58134	61831	59982	1.93	1.97	1.95
D_4: 2nd F.N of January	41701	49728	45715	1.39	1.58	1.49
D_5: 1st F.N of February	26165	31912	29038	0.87	1.02	0.94

Economics

Among the two varieties tested, gross returns and benefit cost ratio were the highest with brown seeded sesame YLM-66 variety during 2020-21, 2021-22 and in pooled mean which is due to higher seed yield obtained with this variety as compared to white seeded variety Swetha til. With regard to sowing dates, gross returns and benefit cost ratio were the highest with sowing of sesame during second fortnight of December during 2020-21, 2021-22 and in pooled mean which is due to higher seed yield obtained with this sowing window as compared to other sowing windows tried for this study.

Conflict of Interest

There is no conflict of interest between the authors. All authors contributed directly to the article

Conclusions

1. Optimum sowing time for sowing of Sesame under irrigated conditions in North Coastal Zone is second fortnight of December.
2. Among the varieties, brown seeded variety (YLM 66) gave significantly higher seed yield than White seeded Variety (Swetha til) and was found suitable to North Coastal zone.
3. For brown seeded Sesame, YLM 66 sown during first fortnight of December to first fortnight of January gave higher seed yields as compared to other dates of sowing.
4. Delay in sowing beyond first fortnight of January for brown seeded sesame and beyond second fortnight of December for white seeded sesame reduced the seed yield significantly.
5. For white seeded sesame, sowing during second fortnight of December gave higher seed yield.
6. The benefit cost ratio recorded higher with YLM 66 compared to Swetha til and with 1st fortnight of December.

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