observed was 7.25%, 28.5% and white fly population was 1.5 and 2.8 respectively at 30 and 60 DAS. Yield was also higher in T_1 plot i.e.1798 kg/ha, having B:C ratio of 2.4 while the control plot ($T_{2)}$ recorded less yield of 1500 kg/ha and B:C ratio of 2.2. These results are in conformity with Singh *et al*. (2002), who suggested that seed treatment with imidacloprid (Gaucho 70WS) @5g/kg of seed reduced whitefly (vector population) incidence compared to untreated plot and reduced leaf curl incidence in cotton. Insecticides such as flonicamid 50%WG, thiamethoxam 25% WG, diafenthiuron 50% WP were found effective against sucking pests including whiteflies in cotton (Jagadish Baraskar and Paradkar, 2020). In this experiment also, seed treatment with Imidacloprid 600FS @ 5 ml/kg seed and foliar spray with Diafenthiuron 50 WP @ 1.25 g/l at 30 and 45 DAS has given good control over whitefly population and leaf curl incidence, thus it recorded higher B:C ratio compared to farmers practice.

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Table: Leaf curl incidence, yield and economics in on farm validation trial

Treatments	Leaf curl incidence (%)		Whitefly population/pl		Yield (kg/ha)	CoC (Rs.)	Gross returns	B:C ratio
	30 days	60 days	30 days	60 days				
T1: Seed treatment with Imidacloprid 600FS @ 5 ml/kg seed + foliar spray with Diafenthiuron 50 WP @ 1.25 g/l at 30 and 45 DAS.	2.4	10.5	1.0	1.75	1798	30400	71920	2.4
T2: Control (farmers practice): without any chemical spray.	7.25	28.5	1.5	2.8	1500	27000	60000	2.2

Cost of cultivation: Diafenthiuron 50 wp (polo) (500 g) -- Rs. 1050/-, seed sale price: Rs.35/-/kg

Combining ability for capsule characters in sesame (*Sesamum indicum L.*)

K T RAMYA*, A L RATHNAKUMAR, H H KUMARASWAMY, J JAWAHARLAL AND RATNAKUMAR PASALA

ICAR-Indian Institute of Oilseeds Research, Rajendranagar, Hyderabad-500 030, Telangana, India
Corresponding author's E-mail: ramya.kt@icar.gov.in

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Abstract

The combining ability for capsule characters was estimated in 8x8 full diallel mating design using 8 elite varieties of sesame which are cultivated across different geographical regions in India. The ratio of GCA: SCA indicated predominance of non- additive gene effects for capsule characters. Among 8 parents, GT-2 was the best general combiner of capsule width, capsule length and seed number/capsule, while TKG-22 was the best combiner for seed weight/capsule.

Keywords: Capsule characters, Combining ability, Sesame

Sesame (*Sesamum indicum* L.) is an important oilseed crop grown in tropical and subtropical conditions. Genetic improvement of seed yield and its associated characters is a continuous effort which is practiced to enhance sesame production and productivity across the globe. Understanding of gene effects of yield and related characters is the primary requirement for developing breeding strategies. Griffing's method of diallel analysis is used to determine additive and non additive gene effects through general combing ability and specific combing ability. The inheritance for yield and its attributing characters along with phenological characters were studied through combing ability studies by Griffing's method of diallel analysis (Das and Gupta 1999, Banerjee and Kole 2009, Pandey *et al.* 2018). Capsule characters are the important characters associated with seed yield in sesame. However, there are limited studies on capsule characters because of labour involved in data recording. In this study, efforts were made to characterise the capsule characters and general combining ability components and the heritability was worked out. Best parents and cross combinations for caspsule characters was identified for further breeding programme.

MATERIALS AND METHOD

The experiment was conducted at experimental farm of ICAR-Indian Institute of oilseeds research, Hyderabad characterized with red sandy loam type of soil. Eight elite varieties *viz.,* E-8 grown in Karnataka (*kharif*), GT-2 in Gujarat (*kharif*), HT-1 in Haryana (*kharif*), PHULE TIL in Maharashtra (*kharif*), RT-351 in Rajasthan (*kharif*), Swetha til in Telangana (Summer), TKG-22 in Madhya Pradesh (*kharif*) and VRI-3 in Tamil Nadu (Summer) were selected as parents. These parents were crossed in a 8 x8 full diallel mating design and F1, reciprocal F1 and parents were raised in the plot size of 4.05 sq m, balanced block design to evaluate for yield and its attributes during *kharif* 2019. Twenty capsules from main branch were harvested from 5 plants at physiological maturity and were kept in oven at 35◦C temperature for 4 days to maintain uniform moisture. Data on capsule width, length, seeds/capsule, seed weight/capsule, number of capsules, oil content and test weight were recorded. The analysis of variance and combining ability (GCA and SCA) was estimated according to method 1 of model –I of Griffing theory (Griffing, 1956). The same model was employed for the assessment of the *gca* effects associated with each parent, the *sca* effects associated with each cross, as well as variance of the effects and narrow and broad sense heritability.

RESULTS AND DISCUSSION

Results of combining ability analysis revealed that mean squares for general combing ability (GCA) and specific combing ability (SCA) were significant. This suggested significant differences among GCA effects of 8 parents and SCA effects of 56 crosses. The significant reciprocal effects indicated the presence of maternal effects for capsule characters except seed weight/capsule. The GCA: SCA ratio <1 indicated predominance of non-genetic variance (Table 1). Rankings of parents based on GCA effects put GT-1 as the best general combiner for capsule width, capsule length and seed number/plant followed by Phule til as the best combiner for capsule width, number of capsules, oil content and plant height. Cross combination between E-8 x HT-1 was superior for capsule width, capsule length, seed number/capsule and seed weight/capsule as indicated by positive and high SCA effect. Heritability (narrow sense) was medium for all capsule character 0.2-0.38). Selection followed by progeny testing at every generation is necessary to improve these traits.

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Table 1: Combining ability variance components and heritability in 8 x 8 diallel

Characters	σ^2gca	σ^2sca	σ^2gca/sca	σ^2a	Phenotypic Variance	Genotypic Variance	Broad-sense Heritability	Heritability in narrow sense
Capsule width	0.08	1.93	0.04	0.20	0.69	0.68	0.99	0.29
Capsule length	3.26	35.72	0.09	5.48	14.53	14.38	0.99	0.38
Number of capsules/plant	86.29	386.02	0.22	108.37	229.42	196.69	0.86	0.47
Oil content (%)	0.80	4.40	0.18	1.06	2.40	2.07	0.86	0.44
Plant Height	28.84	268.64	0.11	44.47	125.59	106.98	0.85	0.35
Seed number/capsule	2.78	178.05	0.02	13.85	59.09	58.12	0.98	0.23
Seed weight/capsule	109.28	7937.60	0.01	582.58	2613.91	2551.34	0.98	0.22
Test weight	0.01	0.15	0.05	0.02	0.06	0.05	0.82	0.27

Niger germplasm evaluation for major morphological and agronomical traits

H D PUSHPA*, M SUJATHA, D P MEGHANA, HELAN BABY THOMAS, PRADUMAN YADAV, CH KRISHNA CHAITANYA, H BASAMMA, PRASHANT K JAGTAP, RAJANI BISEN AND S RAJKUMAR

ICAR-Indian Institute of Oilseeds Research, Rajendranagar, Hyderabad-500 030, India
* Corresponding author's E-mail: pushpa.hd@icar.gov.in

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ABSTRACT

A panel of niger (*Guizotia abyssinica* (L.f) Cass) accessions were augmented and evaluated to characterize for various morphological and agronomical traits. The analysis of variance has shown that there was a significant