

Original Research Article

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## DUS Testing of Sesame (*Sesamum indicum* L.) Accessions Using Morphological Descriptors and Evaluation for Foliar Diseases of Sesame

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### ABSTRACT

The aim of the present study is to characterize Seven hundred and twenty accessions of Sesame (*Sesamum indicum* L.) along with two National check varieties viz., GT-10, TKG-22 and local check variety DS-5 were characterized based on the DUS descriptors. The experiment was executed in Augmented Block Design without replication at All India Co-ordinated Research Project on Sesame and Network on Niger experimental plot, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka during *kharif* 2016. On the basis of DUS descriptors, Sesame accessions were characterized for twenty morphological descriptors and grouped into five DUS traits, viz. Growth, Stem, Leaf, Inflorescence and Capsule characters and evaluated for foliar diseases. A significant amount of variation was observed for most of the traits studied. Study of growth traits clearly revealed that majority of the genotypes showed variability for growth habit towards semi-erect types with determinate growth types and sparse hairiness on stem with majority of basal branching pattern. Towards stem characters, higher frequency of sparse/weak hairiness, lanceolate leaf shape for middle leaves, linear leaf shape for top leaves, entire basal leaf margin, absence of lobe incision of basal leaf and green petiole colour for leaf characters was observed in the studied set, respectively. Regarding inflorescence descriptors, 86.7 % of accessions exhibited one flower/leaf axil. Flower interior and exterior colour 38-39 % respectively. Sparse type corolla hairiness was in majority. Similarly, four number of locules/capsule, narrow oblong bicarpellate capsule shape, monocapsular arrangement, glabrous type of capsule hairiness for capsule characters also in higher frequency. 26.3 per cent of tested accessions have recorded beige colour at post harvest stage. Among 720 accessions studied only 1.3 % of accessions rated grade 2 for bacterial leaf blight and 9.3 % of accessions scored grade 3 for *Cercospora* leaf spot indicating moderately resistant genotypes. The identified DUS traits will serve as a marker in selection process which are less influenced by environmental fluctuations and are easily scorable and stable expression. They serve as diagnostic descriptors of germplasm accessions and hence useful to avoid mistakes in labelling, aid identification and minimize duplication in the germplasm and helps in the development of guidelines for varietal release and registration of new varieties of sesame. The study revealed the distinct characteristics of sesame accessions for morphological variations that exist in these lines due to variation in genetic makeup and could be better utilized by breeders in the selection based on their specific requirement for breeding programme. This study is highly useful for varietal identification and conservation.

### Keywords

DUS testing,  
Characterization,  
Accessions,  
Sesame,  
*Cercospora*,  
Bacterial leaf blight

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## Introduction

Sesame (*Sesamum indicum* L.), a member of the order Tubiflorae belongs to family *Pedaliaceae* is an ancient oil seed known to humankind, sesame seeds have been widely employed in culinary as well as in traditional medicines for their nutritive, preventive, and curative properties, (Weiss, 1971). It is an important annual oilseed crop in the tropics and warm subtropics, where it is usually grown in small plots (Bedigian and Harlan, 1986). Owing to its high quality, Sesame is also referred to as the “Queen of oil seed crops” (Deepthi *et al.*, 2014) because it contains high oil (38- 54%), protein (18-25%), calcium, phosphorous, oxalic acid and excellent qualities of seed oil and meal (Prasad, 2002). Sesamum seed oil has long shelf life due to the presence of lignans *viz.*, Sesamin, Sesaminol and Sesamolol which have remarkable antioxidant function, resisting the oxidation. They are highly valued for their oil which is exceptionally resistant to rancidity. "Open sesame" the famous phrase from the Arabian Nights reflects the distinguishing feature of the sesame seed pod, which bursts open when it reaches maturity. Characterization should eventually lead to a system of recording and storing useful data that can be readily retrieved and made available to others and help in planning breeding programmes (Debas *et al.*, 1994). Among the several limiting factors for successful sesame production, yield loss due to diseases is one of the major constraints. Sesame suffers from many foliar diseases *viz.* *Cercospora* leaf spot, Powdery mildew, *Alternaria* and bacterial leaf blight. Germplasm forms the raw material for any crop improvement programme. There is wide genetic diversity available in sesame and characterizing these resources is a prerequisite for the genetic improvement of its cultivars. The characterization and evaluation are the important pre requisites for effective

utilization of germplasm and also to identify sources of useful genes (Upadhayay *et al.*, 2010). In order to introduce a new plant variety to the markets commercially, it is necessary to register newly bred variety, which relies upon the results of DUS (distinctness, uniformity and stability) tests for a new genotype to be registered as a commercial variety, it needs to be distinct from all other released varieties, uniform and stable for morphological and other evaluated traits (Lombard *et al.*, 2000 and Tommasini *et al.*, 2003). Therefore, DUS test has been established to be the foundation of plant variety protection and also to identify a new variety from reference collection (Kwon *et al.*, 2005). There are several issues to be resolved with yield and yield attributing traits like seed yield, frequency of shattering and oil content. Ideotype breeding aimed at modifying the plant architecture is also time-tested strategy to increase the yield potential. Therefore, the present study was undertaken to characterize the accessions using DUS descriptors in sesame.

## Materials and Methods

Seven hundred and twenty accessions of Sesame along with two National check varieties *viz.*, GT-10, TKG-22 and DS-5 as Local check were grown using unreplicated augmented block design (Federer, 1956) at All India Co-ordinated Research Project on Sesame and network on Niger experimental plot, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka during *Kharif* 2016. The distance between rows was maintained at 30 cm and plant to plant 10 cm. The crop was raised under recommended package of practices along with prophylactic protection measures. The recommended dose of fertilizer was 50:25:25 NPK Kg/ha. The basal dose of 25:25:25 NPK Kg/ha was applied at the time of sowing and remaining 25 kg of nitrogen

was applied 30 days after sowing as top dressing. The plants were thinned out 20-25 days after sowing leaving a single healthy seedling at a distance of 10 cm per hill. The crop was kept weed free and three hand weeding were carried out during the crop growth period. Necessary plant protection measures were taken to control pest and disease. Due to severe Bacterial leaf blight, Powdery mildew and *Cercospora* leaf spot diseases during flowering to capsule formation stage, COC (0.2g) + Streptocyclin (0.5g) per litre of water was sprayed to control Bacterial leaf blight and Carbendazim @ 0.1 per cent was sprayed for the effective control of *Cercospora* leaf spot (Palakshappa *et al.*, 2009)

The observations were recorded on plant growth type, plant growth habit, Stem hairiness and branching pattern as plant descriptors. Leaf hairiness, leaf shape, basal leaf margin lobe incision of basal leaf and petiole colour as leaf descriptors.

Number of flowers per leaf axil, Corolla hairiness, Exterior corolla colour and Interior corolla colour as inflorescence descriptors. No. of locules per capsule, Bicarpellate capsule shape, Capsule arrangement, Capsule hairiness, Colour of dry Capsule (Sun dried) and Type of capsule break as Capsule descriptors with Seed coat colour. Also recorded plant height, number of branches, number of capsules, test weight along with screening for bacterial leaf blight and *Cercospora* leaf spot resistance in the present study according to 0-5 scale (Anonymous, 2015) for recording *Cercospora* and bacterial leaf blight disease score adapted by Project Co-ordinating Unit, All India Coordinated Research Project on Sesame and Niger (Indain Council of Agricultural Research) JNKVV Campus, Jabalpur, Madhya Pradesh, India.

## DUS Testing

Twenty morphological descriptors have been considered essential for the description of Seven hundred and twenty accessions of sesame using guidelines for the conducting test for distinctiveness, uniformity and stability in sesame according to Descriptors for Sesame (*Sesamum spp.*) 2004 developed by IPGRI Rome, Italy and NBPGR New Delhi, India and data analysis for frequency distribution was analysed by Statistical Package for Social Science (SPSS).

## Results and Discussion

The germplasm accessions under study showed wide range of variability for all the qualitative traits studied. Twenty qualitative traits were recorded for seven hundred and twenty accessions along with national checks GT-10 and TKG-22 and local check DS-5. The accessions were characterized based on the variability present in each one of the qualitative traits under different sub descriptors. The results for each trait are described briefly presented in Table 1 and its graphical representation is shown in Figure 1a, 1b, 1c and quantitative characters in Table 2. Characterization at different growth stages of crop were discussed below.

## Plant descriptors

Depending on the plant growth type, the accessions were classified into determinate and indeterminate. Majority of genotypes exhibited determinate (63.1%) and 36.9 % exhibited indeterminate growth type. In case of plant growth habit higher frequency of semi-erect (42.7 %) with sparse stem hairiness of 52.3 % followed by dense hairs on stem with 20.7 %.

Similar results were reported by (Bhagwat Singh *et al.*, 2017) in Sesame and (Harshiya

Banu *et al.*, 2018) in foxtail millet. Hairiness and pubescence is reported in effective for conferring resistance to insect pests in Dolichos bean (Jagadeesh Babu *et al.*, 2008). Basal and top branching pattern exhibited to an extent of 52.6 % and 38.8 %, respectively. Hairiness is the significant character for improving more seed yield and natural defense mechanism for biotic and abiotic factors. So this character may be recognized as ideal plant type. In the present study basal and top branching patterns were observed and it was indicated that the inheritance of branching habit was determined by one single dominant gene. However genetic basis of them has remained elusive. Similar findings have been reported in Sesame by Sarita *et al.* (2013).

### **Leaf descriptors**

Only 6 % of accessions exhibited profuse leaf hairiness followed by 22.4 % of medium hairiness accessions indicating absence of bristles or pubescence containing silica can significantly enhance insect pest resistance in plants with consequent yield increases according to Laing *et al.* (2006) in *poaceae* family. Leaf shape revealed 32.4 % and 64 % of lanceolate and linear leaf shape respectively. Similar results were observed by Kashiram (1930) in Sesame. Majority of accessions are entire type basal leaf margin (45.8 %) whereas dentate and serrate revealed with a frequency of 34.2 % and 20.0 % respectively. Similar report was observed by Suhasini (2006) in Sesame. With respect to lobe incision of basal leaf most of genotypes do not have lobes on basal leaf and only 2.4 % accessions recorded strong lobe incision on basal leaf. About 99.2 % of genotypes recorded green petiole colour at peak flowering stage did not show variability among accessions due to low intensity of anthocyanin pigmentation which is governed genetically and also influenced by the light

intensity and nutritional status of the soil under which the crop is raised. Similar results were also reported by Ezilkumar (1999) and Jain *et al.* (2002). At maturity indicating that high yield was associated with purple pigmentation in plant parts was reported by Shigeta (1985) in finger millet. These findings are in consonance with those of Harshiya Banu *et al.*, (2018)

### **Inflorescence descriptors**

Only 13.3 % of genotypes have more than one flower per leaf axil and sparse type corolla hairiness was observed up to an extent of 38.9 %. Regarding exterior and interior corolla colour, both exhibited white colour (39 % and 38.8 %) of total accessions respectively followed by white with pink shading (27.2 % and 26.0 %) and purple colour is just 0.1 %. This observation in Sesame is in accordance with Suhasini (2006) and Bhagwat Singh *et al.* (2017). Similar study reported in Foxtail millet by Harshiya Banu *et al.* (2018) indicating non-pigmented inflorescence was represented in higher frequency than those with pigmented inflorescence accessions.

### **Capsule descriptors**

Majority of accessions observed to be four locules per capsule (95.7 %) and 1.4 % of six and eight locules per capsule, but four locules are preferred by the breeders due to fertile seed whereas, six and eight locules per capsule are not selective due to chaffy seeds. Similar findings have been reported by Bhagwat Singh *et al.* (2017). Regarding shape of capsule 47.6 % of accessions exhibited narrow oblong bicarpellate capsule shape and 94.4 % are monocapsular arrangement of capsules. Capsule hairiness (11.5 %) are strong or profuse. Brown/tan colour of dry capsule (49.3 %) and 41.5 % are yellow/straw colour. Majority of long type of capsule break was 29.0 % and short type break was

observed to be 26.5 %. The present results are in consonance with observations of Bhagwat Singh *et al.* (2017) and Suhasini (2006) suggesting short capsule break with less shattering reflects in yield increase and farmers preference.

**Table.1** Morphological characterization of germplasm for descriptor exhibition with frequency and percent score in Sesame accessions

Sl. No.	Descriptor	Sub descriptor	Score	Frequency observed	Percent score
<b>Plant descriptor</b>					
<b>1</b>	Plant growth type	Indeterminate	1	266	<b>36.9</b>
		Determinate	2	454	<b>63.1</b>
<b>2</b>	Plant growth habit	Prostrate	1	154	<b>21.4</b>
		Semi-erect	2	308	<b>42.7</b>
		Erect	3	258	<b>35.9</b>
<b>3</b>	Stem hairiness	Absent	1	194	<b>27.0</b>
		Sparse	3	377	<b>52.3</b>
		Dense	5	149	<b>20.7</b>
<b>4</b>	Branching pattern	Non branching	0	66	<b>9.1</b>
		Basal branching	1	371	<b>51.6</b>
		Top branching	2	279	<b>38.8</b>
		Other	3	04	<b>0.5</b>
<b>Leaf descriptor</b>					
<b>5</b>	Leaf hairiness	Glabrous	0	168	<b>23.3</b>
		Weak	3	348	<b>48.3</b>
		Medium	5	161	<b>22.4</b>
		Strong	7	43	<b>6.0</b>
<b>6</b>	Leaf shape	Linear	1	461	<b>64.0</b>
		Lanceolate	2	233	<b>32.4</b>
		Elliptic	3	23	<b>3.2</b>
		Ovate	4	03	<b>0.4</b>
		Narrowly cordate	5	00	<b>0.0</b>
<b>7</b>	Basal leaf margin	Entire	1	330	<b>45.8</b>
		Serrate	2	144	<b>20.0</b>
		Dentate	3	246	<b>34.2</b>
<b>8</b>	Lobe incision of basal leaf	Absent	0	339	<b>47.0</b>
		Weak	3	225	<b>31.3</b>
		Medium	5	139	<b>19.3</b>
		Strong	7	17	<b>2.4</b>
<b>9</b>	Petiole colour	Green	1	714	<b>99.2</b>
		Greenish purple	2	04	<b>0.5</b>
		Purple	3	02	<b>0.3</b>
		Pink	4	00	<b>0.0</b>
<b>Inflorescence descriptor</b>					
<b>10</b>	Number of flowers per	One	1	624	<b>86.7</b>

	leaf axil	More than one	2	96	<b>13.3</b>
<b>11</b>	Corolla hairiness	Absent	1	276	<b>38.3</b>
		Sparse	3	280	<b>38.9</b>
		Dense	5	164	<b>22.8</b>
<b>12</b>	Exterior corolla colour	White	1	281	<b>39.0</b>
		White with pink shading	2	196	<b>27.2</b>
		White with deep pink shading	3	70	<b>9.8</b>
		Pink	4	150	<b>20.8</b>
		Light violet	5	13	<b>1.80</b>
		Dark violet	6	09	<b>1.3</b>
		Purple	7	01	<b>0.1</b>
		Red	8	00	<b>0.0</b>
		Light maroon	9	00	<b>0.0</b>
		Other	99	00	<b>0.0</b>
		<b>13</b>	Interior corolla colour	White	1
White with pink shading	2			187	<b>26.0</b>
White with deep pink shading	3			72	<b>10.0</b>
Pink	4			153	<b>21.2</b>
Light violet	5			13	<b>1.8</b>
Dark violet	6			15	<b>2.1</b>
Purple	7			01	<b>0.1</b>
Red	8			00	<b>0.0</b>
Light maroon	9			00	<b>0.0</b>
Other	99			00	<b>0.0</b>
<b>Capsule descriptor</b>					
<b>14</b>	Number of locules per capsule	Four	1	689	<b>95.7</b>
		Six	2	10	<b>1.4</b>
		Eight	3	10	<b>1.4</b>
		Mixed	4	11	<b>1.5</b>
<b>15</b>	Bicarpellate capsule shape	Tapered at apex	1	52	<b>7.2</b>
		Narrow oblong	2	343	<b>47.6</b>
		Broad oblong	3	211	<b>29.4</b>
		Square	4	114	<b>15.8</b>
<b>16</b>	Capsule arrangement	Monocapsular	1	680	<b>94.4</b>
		Multicapsular	2	40	<b>5.6</b>
<b>17</b>	Capsule hairiness	Glabrous	0	249	<b>34.6</b>
		Sparse	3	228	<b>31.7</b>
		Medium	5	160	<b>22.2</b>
		Strong	7	83	<b>11.5</b>
<b>18</b>	Colour of dry Capsule (Sun dried)	Green	1	26	<b>3.6</b>
		Straw/yellow	2	299	<b>41.5</b>
		Brown/tan	3	355	<b>49.3</b>
		Purple	4	00	<b>0.0</b>



<b>19</b>	Type of capsule break	Short	1	191	<b>26.5</b>
		Long	2	209	<b>29.0</b>
		Curved	3	136	<b>18.9</b>
		Cleft	4	144	<b>20.0</b>
		Other	99	00	<b>0.0</b>
<b>Seed descriptor</b>					
<b>20</b>	Seed coat colour	White	1	02	<b>0.2</b>
		Cream	2	66	<b>9.2</b>
		Beige	3	190	<b>26.3</b>
		Light brown	4	118	<b>16.3</b>
		Medium brown	5	124	<b>17.2</b>
		Dark brown	6	126	<b>17.5</b>
		Brick red	7	05	<b>0.7</b>
		Tan	8	00	<b>0.0</b>
		Olive	9	00	<b>0.0</b>
		Grey	10	02	<b>0.2</b>
		Dull black	11	33	<b>4.6</b>
		Bright black	12	14	<b>1.2</b>
		Other	99	00	<b>0.0</b>
		<b>Disease score</b>			
<b>1.</b>	Bacterial leaf blight	No infection (Immune)	0	00	0.0
		Resistant	1	00	0.0
		Moderately resistant	2	09	1.3
		Moderately susceptible	3	513	71.3
		Susceptible	4	189	26.3
		Highly susceptible	5	09	1.3
<b>2.</b>	<b><i>Cercospora</i> leaf spot</b>	No infection (Immune)	0	00	00
		Resistant	1	00	00
		Moderately resistant	2	00	00
		Moderately susceptible	3	67	9.3
		Susceptible	4	606	84.2
		Highly susceptible	5	47	6.5

**Table.2** Variability for morphological traits and promising lines identified for economic importance

Character	Min	Max	Mean	Promising accessions
<b>Days to maturity</b>	77	106	86.2	IC0131801, IC0049260, IC0259397, IC0044245, IC0325998, IC0131755, IC0132349, IC0204834, IC0205314, IC0268360, IC0205492, IC0325840, IC0325969, IC0326040 and EC0043760
<b>Plant height (cm)</b>	25.3	135.7	72.1	IC0014143, EC0044247, IC0023288, IC0041953, EC0133857, IC0021625, IC0023298, IC0016243, EC0044246, IC0132103, IC0021690, IC0131970, IC0042459, IC0326040 and IC0127279
<b>Number of branches</b>	1.0	8.7	3.7	IC0011274, IC0350397, IC0127294, IC0595438, IC0249016, IC0014173, IC0024207, IC0041910, IC0041951, IC0041954, IC0041977, IC0043014, IC0110789, IC0127265 and IC0131880
<b>Number of capsules</b>	0.7	83.0	18.7	IC0014143, IC0127279, IC0023298, IC0021625, IC0023320, IC0127265, IC0041953, IC0016243, IC0021687, IC0132103, IC0132047, IC0014146, IC0042459, IC0014302 and IC0127294
<b>1000 seed weight (g)</b>	1.0	3.0	2.1	IC0014125, IC0001423, IC0014760, IC0043654, IC0021690, IC0132018, IC0132055, IC0132125, EC0089112, IC0014117, IC0014131, IC0024212, IC0043087, IC0132047 and IC0132052



**Table.3** Accessions performing multiple traits in Sesame germplasm

Accession	Plant characters		Stem characters		Leaf characters			Inflorescence characters			Capsule characters						Quantitative traits					Seed Characters		Disease Score	
	PGT	PGH	SH	BP	LH	BLM	PC	FLA	CH	ECC	LOC	BCS	CPA	CPH	CDC	TCB	DM	PH	NB	NC	TW	SC	BLB	CLS	
IC0350397					7	2			5	3		2	1				88	88.7	7.7			3	2	4	
IC0325998		2		2	7						2			7	2		79				2.4	2	2	4	
IC0326040			3	2		3		1	5	2	1		1	7		2	80					3	2	4	
IC0024207	2	2			5	3	2	1			1		1		3		97					6	2	4	
IC0127265											1	2	1			1	84	76.0	6.0	52		6	2	4	
IC0326111				2		3					3		1		2		87	101.3				4	2	4	
IC0331712						3			5		1	4	1	7	2	1	87	89.3	5.3	39		4	2	4	
IC0331713						3			5		1	2	1	5	2		86	94.0	4.7	24		5	2	4	
IC0021690		3	5	2	7	2		2	5					7	2										
EC0089111	2	3						2		5		2	2		2			36.7			1.7	3	3	4	
IC0014143		3		2				2							2			135.7	5.0	83		3			
IC0011274				2		2		1			1	2	1		3	1		62.3	8.7	37		4			
IC0014125	2	3						2		5		2						68.0		30	3.0	5			
IC0131740		3		2	7	2	3		5						2	1						6	3	4	
IC0014760	2		5			3						2						79.3	4.3	38	2.9		3	4	
EC0043708	2	3										2						82.7		24	2.2	1			
IC0049260	2	3	5			3								2				78			2.1		3	4	
IC0131801	2				7										2			77							
IC0259397				2					5									78			2.1				
IC0370503										4	1		1	7	2	1		81				3	2		
IC0127279			5									2						99.0		79		2	3	3	

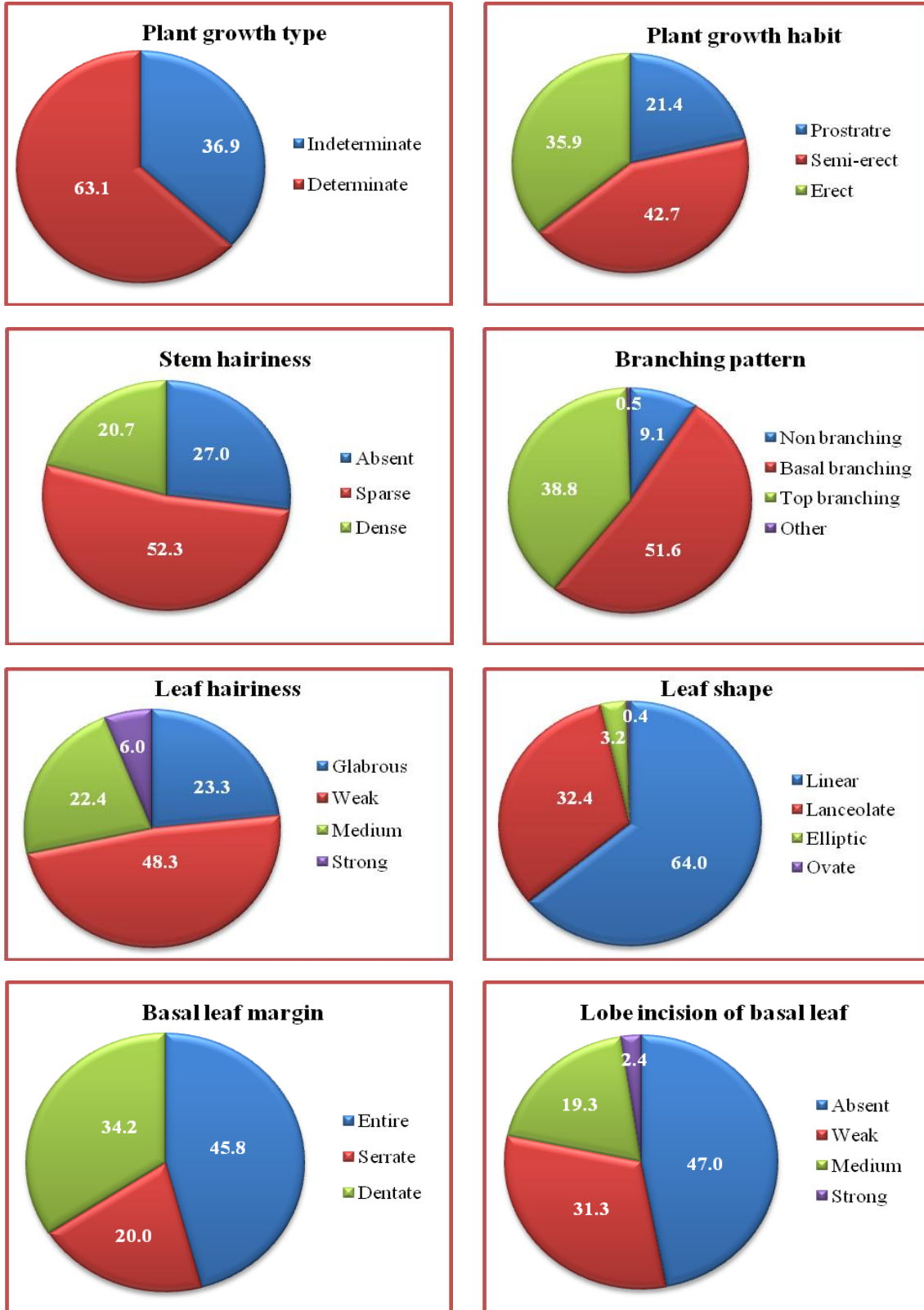
PGT: Plant growth type  
LH: Leaf hairiness  
CH: Corolla hairiness  
CPA: Capsule arrangement  
DM: Days to maturity  
TW: 1000 seed weight

PGH: Plant growth habit  
BLM: Basal Leaf margin  
ECC: Exterior corolla colour  
CPH: Capsule hairiness  
PH: Plant height (cm)  
SC: Seed coat colour

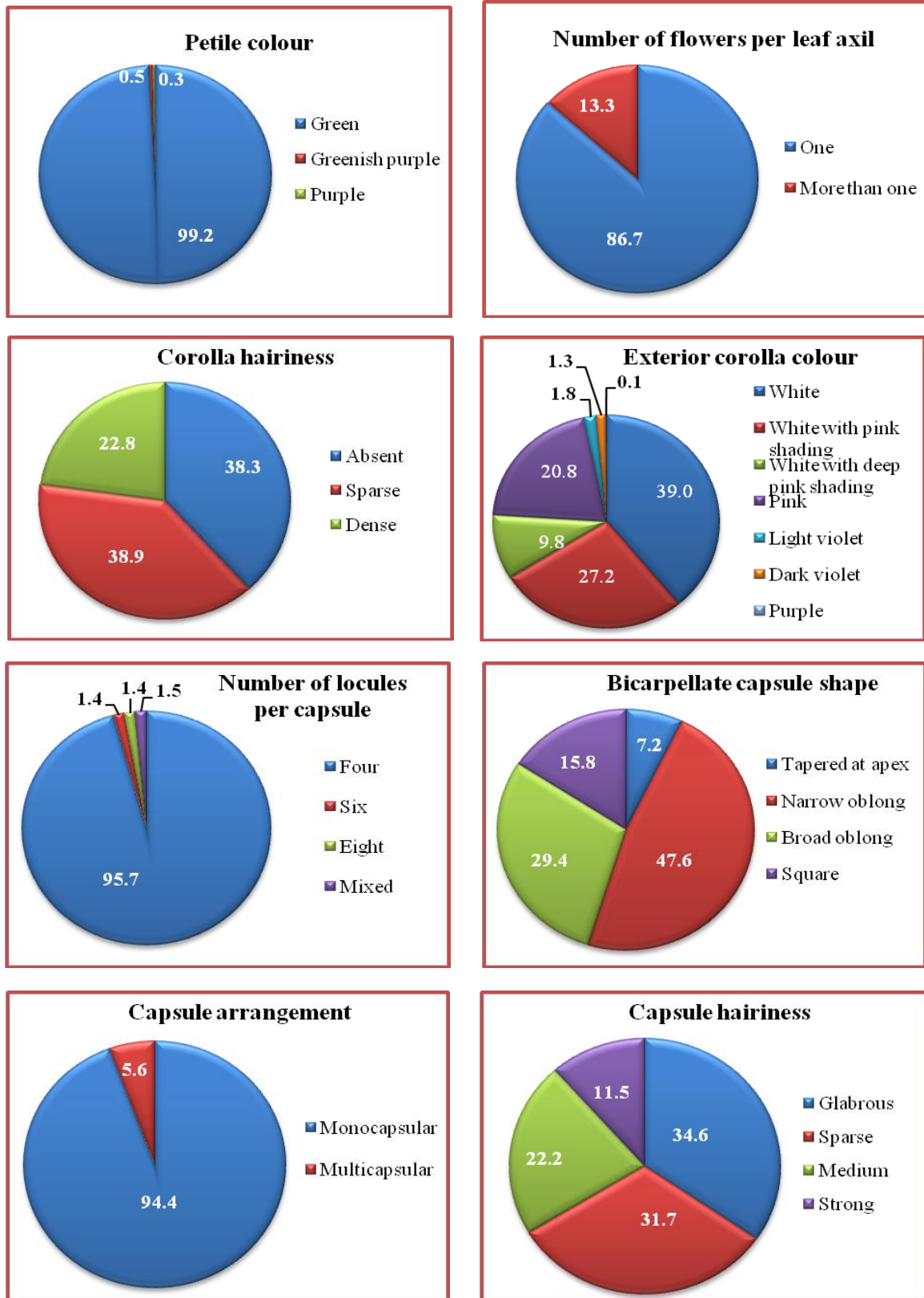
SH: Stem hairiness  
PC: Petiole colour  
LOC: No. of locules per capsule  
CDC: Colour of dry Capsule  
NB: No. of branches  
BLS: Bacterial leaf blight

BP: Branching pattern  
FLA: No. of flowers per leaf axil  
BCS: Bicarpellate capsule shape  
TCB: Type of capsule break  
NC: No. of capsules/plant  
CLS: Cercospora leaf spot

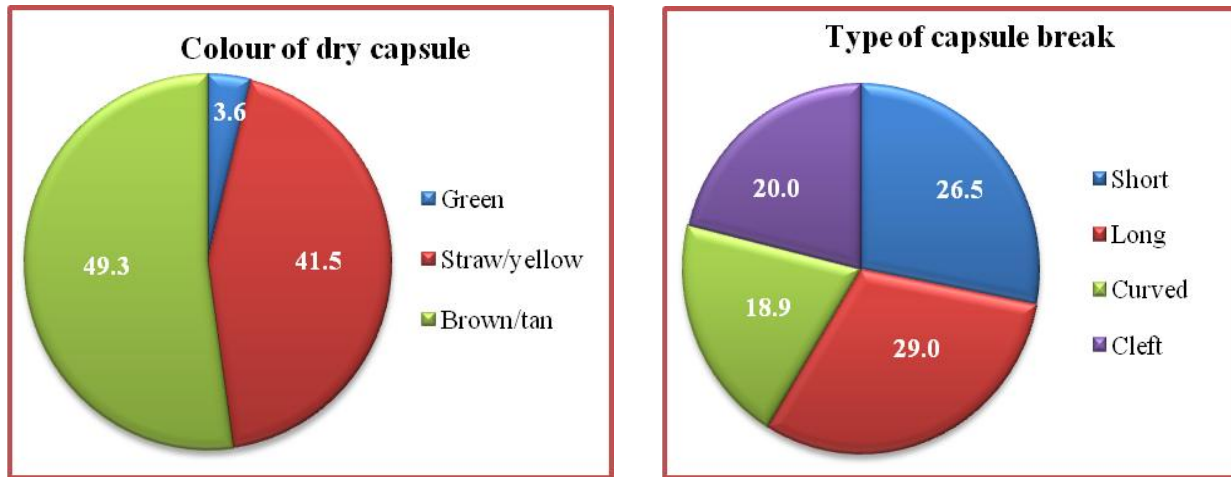
**Fig.1a** Frequency distribution of different morphological traits in Sesame



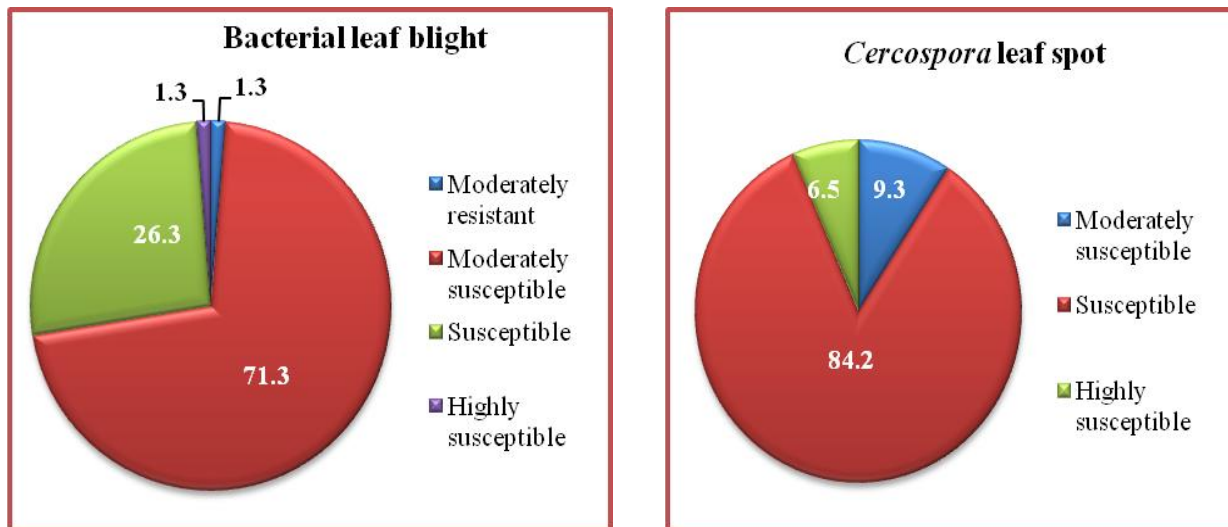
**Fig.1b** Frequency distribution of different morphological traits in Sesame (contd..)



**Fig.1c** Frequency distribution of different morphological traits in Sesame



**Fig.2** Frequency distribution of disease reaction in Sesame



### Seed descriptor

Seed coat colour was beige (26.3 %) followed by dark brown (17.5 %), medium brown (17.2 %), dull black (4.6 %) and cream colour (9.2 %). Most of farmers prefer white to brown seed colour. However, creamy white was in higher frequency as this is the most favored color among the farmers. Similar reports shown by Suhasini (2006) in Sesame. A wide range of variation beige, dark brown, medium brown, cream colour was observed against reported white, black and brown. Research in

Sesame outlined by earlier breeders due to under digenic control with several confusing segregants beyond plausible explanation (Baydar and Turgut, 2000; Falusi, 2007). Zhang *et al.*, (2013) studied using high density linkage map analysed the genetic segregation and QTL for sesame seed colour and showed that two major genes with additive dominant epistatic effects along with polygenes were responsible for controlling seed coat colour. The highest polymorphism was observed from white to black through all intermediate colours.

### **Disease score**

Among the accessions evaluated for foliar diseases, only 1.3 % of accessions rated grade 2 for bacterial leaf blight followed by 71.3 % of grade 3 and 9.3 % of accessions recorded grade 3 for *Cercospora* leaf spot indicating moderately susceptible genotypes in the studied set under protected situation. Totally nine accessions viz., IC0350397, IC0370503, IC0325998, IC0326040, IC0024207, IC0127265, IC0326111, IC0331712 and IC0331713 exhibited moderately resistant to bacterial leaf blight and graphical representation shown in Figure 2.

### **Quantitative characters**

Evaluation for yield and its attributing characters was carried out for identifying elite promising lines as shown in Table 2. For early maturing (77 days) accessions are IC0131801, IC0049260, IC0259397, IC0044245 and IC0325998. For plant height 135.7 cm with average of 72 cm accessions are IC0014143, EC0044247, IC0023288, IC0041953 and EC0133857. Higher number of branches exhibited in IC0011274, IC0350397, IC0127294, IC0595438 and IC0249016 and more number of capsule accessions viz., IC0014143, IC0127279, IC0023298, IC0021625 and IC0023320. Test weight of 1000 seeds promising accessions are IC0014125, IC0001423, IC0014760, IC0043654 and IC0021690 indicating bold seeds.

### **Identification of germplasm accessions for multi-traits**

Among 720 germplasm accessions IC0350397, IC0370503, IC0325998, IC0326040, IC0024207, IC0127265, IC0326111, IC0331712 and IC0331713 exhibited moderately resistant to bacterial leaf blight along with pyramid of characters dense

hairiness on capsules, monocapsular arrangement with four locules per capsule with short capsule break and dentate leaf margin on basal leaf with early maturing accessions as shown in Table 3.

Accession IC0021690 showing multiple traits for erect plant growth habit with dense hairiness, top branching pattern on stem. Regarding leaf characters strong hairs on leaf and serrated type leaf margin. More than one flower per leaf axil and dense corolla hairiness for inflorescence characters. Profuse hairiness on capsules and dry capsules color was observed to be straw yellow with 107.3 cm plant height.

Accession EC0089111 showed determinate growth with erect growth habit for plant characters with more than one flower per leaf axil and light violet exterior corolla colour, narrow oblong bicarpellate capsule shape having straw yellow colour for dry capsules with dwarf type having 36.7 cm of plant height with 87 days of maturity with beige seed colour.

Accession IC0014143 exhibited erect plant growth habit with more than two flowers per leaf axil exhibiting straw yellow colour for dry capsules with highest number of capsules per plant (83) with highest plant height of 135.7 cm. IC0011274 accession was observed to have higher number of branches (8.7) with serrated leaf margin, narrow oblong bicarpellate capsule shape with short type of capsule break.

Accession IC0014125 showed highest test weight of 3.0 g with determinate growth with erect growth habit for plant characters and having more than 2 flowers per leaf axil with light violet exterior corolla colour and bicarpellate capsule shape was narrow oblong. IC0131740 accession exhibited erect growth habit with dense hairs on leaves,



serrated basal leaf margin purple colour petiole colour showing dense hairiness on corolla with straw yellow dry colour capsules with short capsule break with dark brown seed colour.

IC0014760 germplasm accession exhibited determinate growth type, dense hairs on stem, dentate basal leaf margin, narrow oblong bicarpellate capsule shape with higher test weight of 2.9 g.

Accession EC0043708 showed determinate growth with erect growth habit for plant characters, narrow oblong bicarpellate capsule shape with plant height of 82.7 cm and test weight of 2.2 g bearing white seed colour. IC0325998 accession showed profuse leaf hairs for leaf character and for capsule characters exhibited six locules with strong hairiness on capsule, straw yellow dry colour capsules with 79 days of early maturity, test weight of 2.4g bearing cream colour seeds.

Accessions IC0049260, IC0131801 and IC0259397 are early maturing types with 77-78 days with determinate plant growth type.

In conclusions, majority of sesame accessions were found to possess determinate growth type with semi-erect habit bearing sparse hairiness on stem with basal branching pattern with respect to plant descriptors. Abundance of accessions exhibited Linear leaf shape, entire leaf margin with green petiole colour for leaf descriptors. Regarding inflorescence descriptors majority of accessions recorded one flower per leaf axil bearing sparse hairiness with white corolla colour exterior and interior respectively. With respect to capsule descriptor higher frequency of accessions revealed four locules per capsule, monocapsular arrangement with brownish pattern of seed coat colour form light to medium to dark tint with moderately resistant to susceptible accessions for bacterial leaf

blight and *Cercospora* leaf spot respectively. Accessions with pyramid of desired characters viz., IC0350397, IC0370503, IC0325998, IC0326040, IC0024207, IC0127265, IC0326111, IC0331712 and IC0331713 could be used for future crop improvement programmes for biotic and abiotic stress. Above study revealed the distinct characters of sesame accessions and noticed the morphological variations due to genetic make-up and could be better exploited by breeders in selections based on specific requirement for crop improvement programmes and this is highly useful investigation for varietal identification and conservation. The identified DUS traits will serve as a marker in selection process which are less influenced by environmental fluctuations and are easily scorable and stable expression. They serve as diagnostic descriptors of germplasm accessions and hence useful to avoid mistakes in labelling, aid identification and minimize duplication in the germplasm and helps in the development of guidelines for varietal release and registration of new varieties of sesame.

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