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MORPHOLOGICAL CHARACTERISTICS OF SIXTEEN SESAMUM VARIETIES FOR DISTINCTNESS, UNIFORMITY AND STABILITY (DUS) TEST

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ABSTRACT

Sesamum indicum is an important food oil crop of India. It is useful in many aspects like seeds for oil, seed cake (after oil extraction) as fodder, Seeds as one of the richest sources of calcium carrying many nutrients, seeds having therapeutic properties along with many cosmetic uses. For releasing any new variety of crop DUS (Distinctness, Uniformity and Stability) Test is done. For conducting DUS Test many morphological characteristics are observed for several generations and uniformity stability of characteristics are noted down. We observed morphological characteristics of 16 Sesamum crop varieties from different regions of India for DUS Testing. Result shown that even geographically different Sesamum crop can be grouped into one. So,along with morphological characteristics, Biochemical and Molecular markers are also suggested to be included for DUS Testing.

Keywords: *Sesamum indicum, DUS Test*

INTRODUCTION

Importance of plant life have continually been appeared as a key supply for survival and evolution of the animal kingdom, forming a base for each ecological pyramid. The significance of plant life is so apparent that life isn't feasible on the planet without plant life. Man is constantly exploring this 'present of God' and continually been curious to locate extra and extra plant sorts that may advantage the human kind. One such plant, is Sesame (Sesamum indicum L.). Sesame belongs to division Spermatophyta, Subdivision-Angiospermae, Class-Dicotyledoneae, Order-Tubiflorae, Family-Pedaliaceae and Genus-Sesamum (Joshi, 1961; Hutchinson and Dalziel, 1963; Kumar, et. al., 1967; Purseglove, 1974). The genus includes approximately 36 species of which the maximum usually identified is Sesamum indicum (Purseglove, 1974).

The plant Sesamum indicum is a crucial oil seed crop. It is usually cited as 'the queen of the oil seeds' via way of means of distinctive feature of the excellent great of oil it produces. Not only the seeds, different components of Sesame plant are extensively utilized for example, the stems are commonly burned as fuel in which firewood is scarce and the ash is usually used for soap production. The pressed cake after the oil extraction is used as a rich supply of protein for farm animals.

Morphology

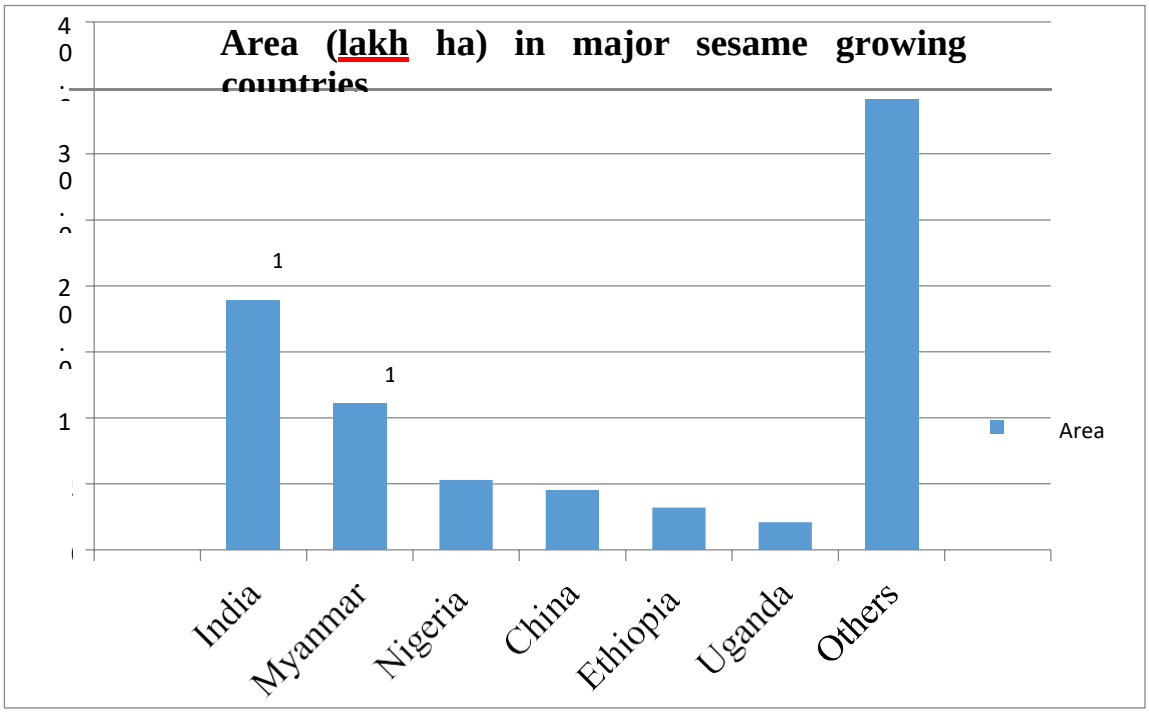
It is an annual plant developing 50 to one hundred cm (2-three feet) tall, with opposite leaves four to14 cm (5.5 in) lengthy with a entire margin ; they're broad lanceolate, to five cm (2 in) broad, at the base of the plant, narrowing to simply 1 cm (1/2 of an inch) broad at the flowering stem. The flowers are white to purple, tubular, three to five cm (1 to two in) lengthy, with a four-lobed mouth. Sesame is commonly self-pollinated, despite the fact that crosspollination via way of means of insects is common. The fruit is a deeply grooved capsule (1 to three inch in length) that incorporates 50 to one hundred or more seeds. The seed mature four to 6 weeks after fertilization. The growth of sesame is indeterminant; that is, the plant maintains to produce leaves, flowers and seeds so long as the weather permits. Sesame seeds are small and vary in colour however 3 distinct seed color are commonly found-white, black and brown. Seeds comprise 50-60% oil and25% protein with antioxidants lignans inclusive of sesamolin and sesamin.

Production

Asian countries like India and China lead in sesame seed production. However, while china outperformed world average yield (535 kg/ha) of sesame seed production with 1234 kg/ha**,** India was lagging with 413 kg/ha production (FY 2015-16). In India, more than 85% production of sesame comes from West Bengal, Madhya Pradesh, Rajasthan, Uttar Pradesh, Gujarat, Andhra Pradesh and Telangana.

Figure 1: Worldwide production of Sesame (*Sesamum indicum*) seeds (FY 2015-16)

Rich in calcium, vitamins B and E, iron, and zinc, sesame is excessive in protein and carries



no cholesterol. It is a key element in lot of global cuisines, in particular Asian, Middle Eastern and Mediterranean. Its oil with 80-85% unsaturated fatty acids, is pretty strong and has reducing impact on cholesterol and stops coronary heart disease. Sesame is used broadly in China, Japan, and Korea as a cooking oil, and it is consumed for its medicinal qualities. *In vitro* research and animal studies have indicated numerous antioxidant in sesame (Namiki and Kobayashi,1989). In the western hemisphere, sesame is more often used in confectionary trade. Throughout the global, sesame seeds or paste are mixed into sweets, e.g., halva. Sesame oil is also used in the beauty products.

The leaves and seed are astringent (Allardic, 1993; Moerman, 1998). The leaves are rich in a gummy substrate and combined with water to make a rich bland mucilage, which is utilized in the remedy of infant cholera, diarrhoea, dysentery, catarrh and bladdertroubles (Grieve, 1984).

The seed is diuretic, emollient,galactogogue, lenitive and tonic (Duke and Ayensu, 1985) and acts as a tonic for the liver and kidneys (Bown, 1995). It is taken internally as a remedy of untimely hair loss and greying, convalescence, continual dry constipation, dental caries, osteoporosis, stiff joints, dry cough etc (Bown, 1995). It has amarked potential to increase milk production in nursing mothers (Chevallier,1996). It is useful in haemorrhoids and ulcers (Bown 1995; Chopra.et.al., 1986). Mixed with limewater, the oil is usedexternally to deal with burns, boils and ulcers (Bown, 1995). A decoction of the root is utilized in diverse traditions to deal with bronchial allergies and coughs (Chevallier,1996).

Sesame diversity had been studied by India, China, Central Asia, Near East and Abysinia in classical research (Zeven andZhukovsky, 1998; Hawkes, 1983). An excessive degree of variability of morphological characters in sesame collections were reported (Bisht, et. al., 1998)

DUS Testing

The determination of genetic distinction is crucial in plant variety protection due to infringement of proprietary rights. Where many of Seed Companies thought to infringe upon the proprietary of other company, which may result into legal complications. To keep away from this, according to National guidelines for DUS, newly bred varieties of crop plant ought to undergo statuary Testing, to decide their eligibility for inclusion in the National List of Varieties. According to guideline of DUS Testing newly bred variety should be proven to be Distinct (D) from other existing varieties, additionally they should display uniformity (U) and Stability (S) within the traits to distinguish and describe them in order to be included in National listing of Plant varieties.

DUS (Distinctness, Uniformity Stability) Test guarantees the quality of new cultivar for farmers and merchants. It is likewise used to protect rights of the plant breeder (plant breeders' rights), which encourages the continuous improvement of new varieties.

Developing a new variety requires skill, labor, resources, and money, and might take many years (10 to fifteen years in case of many plant species). A new variety, as soon as released in market, can be reproduced by others that allows farmers/breeders to deprive its right of the opportunity of earnings. DUS Testing forms the basis for a system of Intellectual Property Protection for plant breeders referred to as Plant Breeder's Right (PBR).

The DUS of the new genotype is set up with the help of new and current varieties by comparing them with the aid of set of morphological characters all through the plant growth period. At phenotypic level, qualitative and quantitatively inherited morphological traits had been used effectively to explain a huge quantity of sorts in diverse crop species. Phenotypic individual expression is, however, affected with inter and intra-locus interactions, in addition to genotype X surroundings interactions, So, modern Biochemical and molecular marker to be included in DUS testing is recommended (Sharma et. al, 2009). Nevertheless, morphological characteristics have been an important aspect of DUS testing So, in this study, Morphological characteristics of 16 sesame genotypes were studied for DUS Testing.

Methodology

The present investigation on the characterization of Sixteen varieties of *Sesamum indicum* for Distinctness, uniformity and stability was carried out at Seed Technology Research, Agriculture Research station, Durgapura (Jaipur) under the project "Implementation and protection of plant
variety and Farmer's right legislation" by PPVRFR authority, Government of India. The genetically pure seed material of 16 Sesamum genotypes representing different geographical locations in India, were collected from the project coordinator (Sesamum and Niger), Indian Council of Agricultural Research, India (Table-1). One week old plants raised and reared under identical conditions served as the source of young leaf tissue used in various experiments and morphological characteristics like plant height, branching pattern, stem hairiness, leaf lobes, leaf size, Flower petal colour, Locule number per capsule, capsule arrangement capsule hairiness etc. were recorded for three consecutive growth seasons (Table 2)

Table 1 : List of Sesamum varieties used in this study.

Genotypes	**Location**
GT-10	Gujarat
Adarsh-8	Gujarat
GT-1	Gujarat
RT-125	Rajasthan
RT-54	Rajasthan
RT-127	Rajasthan
B-67 (Tilottama)	West Bengal
T-13	Uttar Pradesh
YLM-11	Andhra Pradesh
Madhavi	Andhra Pradesh
Punjab Til-1	Punjab
TC-25	Punjab
Kanak	Orissa

TMV-5	Tamilnadu
VS-9701	Tamilnadu
Thilothama	Kerala

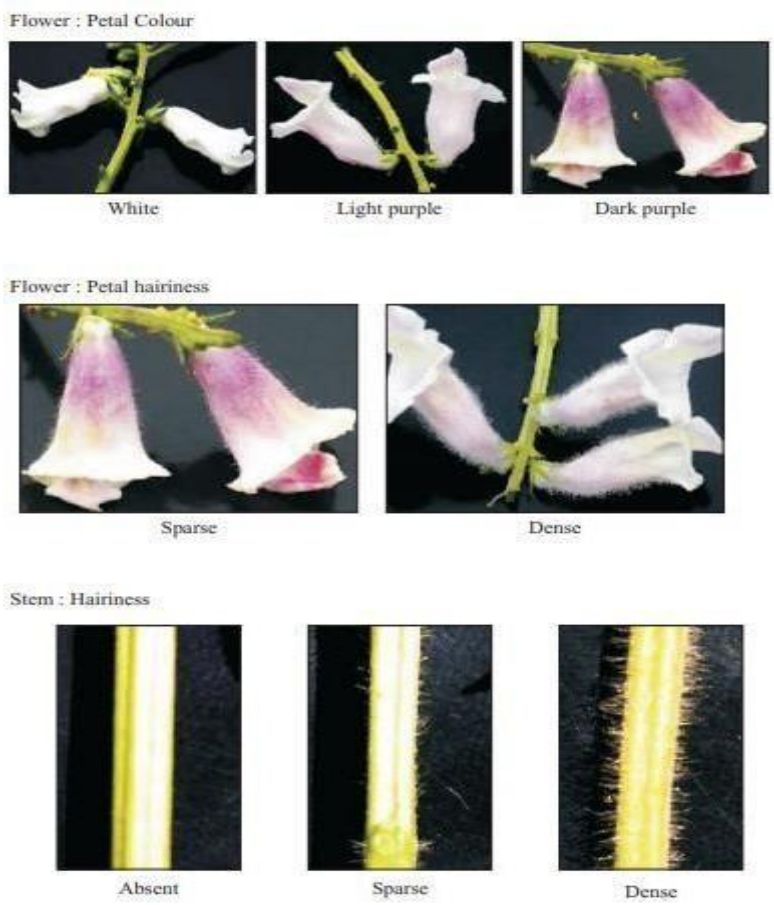


Figure2: Variation in morphological characterestics of Sesamum varieties

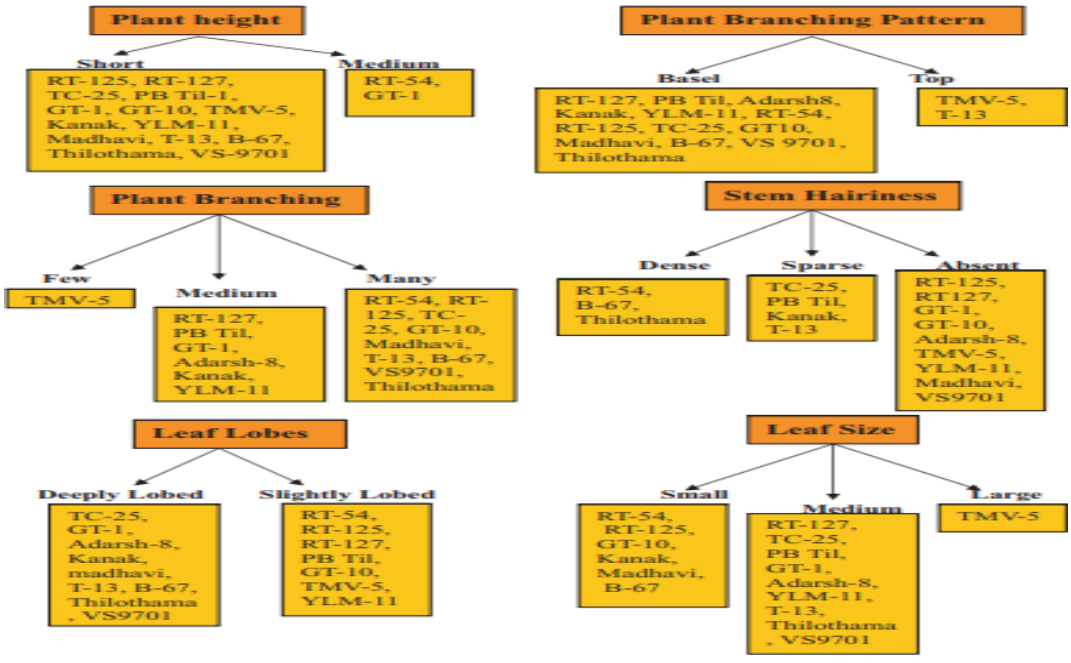


Figure 3: Morphological grouping of sixteen Sesamum varities studied (part 1)

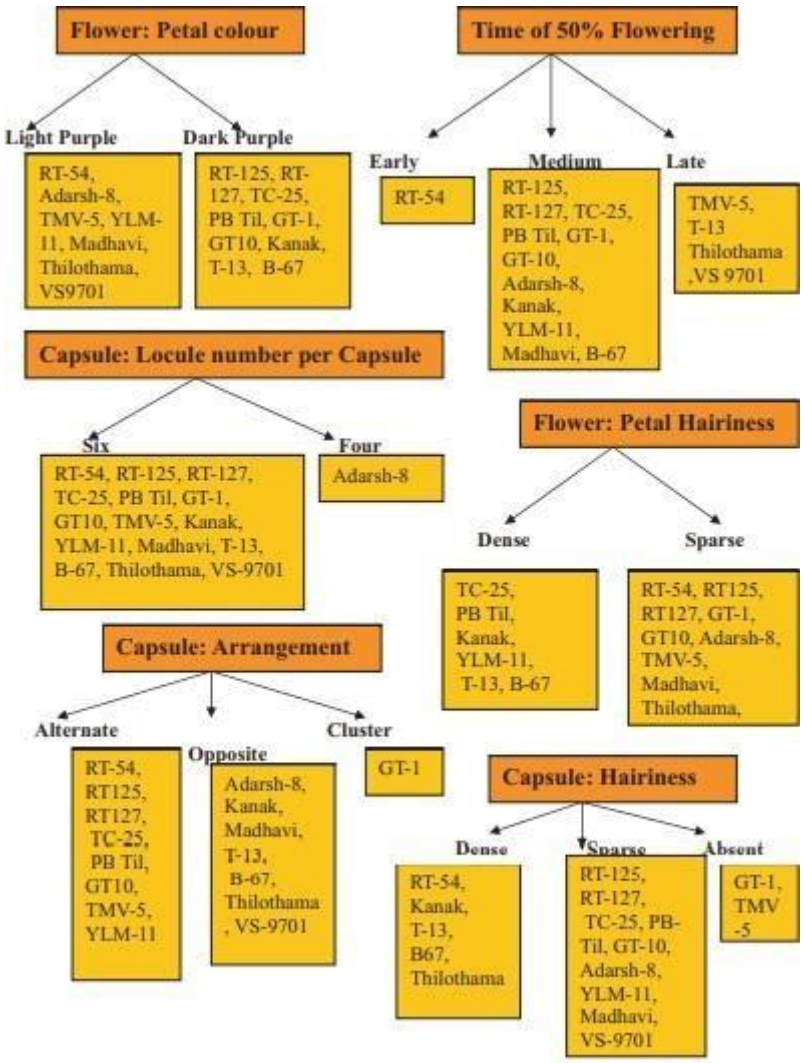


Figure 3: Morphological grouping of sixteen Sesamum varities studied (part 2)

RESULT AND CONCLUSION

Sixteen varieties of Sesamum were grouped on the basis of morphological characteristics. Among these sixteen varieties some varieties shown distinct features as compared to other fifteen e.g. TMV-5 showed few (1-2) branches and large leaf size ulike other 15 varieties which had Medium to many branches and small to medium leaf size, GT-1 showed Cluster Capsule arrangement while

all fifteen showed Alternate or opposite capsule arrangement and Adarsh-8 showed six locule number inside the capsule while other fifteen varieties studied showed 4 locule number. Varieties from same region showed different morphological characteristics as these are affected by environmental conditions, so it is suggested that for DUS testing other Biochemical and Molecular markers should also be used along with morphological for varietal identification.

Table2: Morphological charactersitics of Sesamum indicum (*Banching; Few-1-2,medium-3-4 Many- More than 4)

Sesamum Varities	Plant height (Avg. in cm)	Petal hairiness	Branching*	Leafsize	Leaf lobes	Branching pattern	Capsule hairiness	Capsule Locule numbers	Stem hairiness
	135				Slightl y				

GT-10	cm	Sparse	Many	Small	lobed	Basel	Sparse	4	Absent
Adarsh-8	127	Sparse	Medium	Medium	Deeply Lobed	Basel	Sparse	6	Absent
GT-1	122	Sparse	Medium	Medium	Deeply Lobed	Basel	Absent	4	Absent
RT-125	132	Sparse	Many	Small	Slightl y lobed	Basel	Sparse	4	Absent
RT-54	104	Dense	Many	Small	Slightl y lobed	Basel	Dense	4	Sparse
RT-127	152	Dense	Medium	Medium	Deeply Lobed	Basel	Sparse	4	Absent
B-67 (Tilottama)	132	Dense	Many	Small	Deeply Lobed	Basel	Dense	4	Dense
T-13	125	Dense	Many	Mediu m	Deeply Lobed	Top	Dense	4	Sparse
YLM-11	126	Dense	Medium	Mediu m	Slightl y lobed	Basel	Sparse	4	Absent
Madhavi	133	Sparse	Many	Small	Deeply Lobed	Basel	Sparse	4	Absent
Punjab Til-1	130	Dense	Medium	Mediu m	Slightl y lobed	Basel	Sparse	4	Sparse
TC-25	132	Dense	Many	Small	Deeply Lobed	Basel	Sparse	4	Sparse
Kanak	130	Dense	Medium	Small	Slightl y lobed	Basel	Dense	4	Sparse
TMV-5	127	Sparse	Medium	Large	Slightl y lobed	Top	Absent	4	Absent
VS-9701	137	Sparse	Medium	Mediu m	Deeply Lobed	Basel	Sparse	4	Absent
Thilotham a	141	Sparse	Many	Mediu m	Deeply Lobed	Basel	Dense	4	Dense

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