

MORPHOLOGICAL CHARACTERIZATION OF DIFFERENT SPECIES OF SAFFLOWER (*Carthamus tinctorius* L.) BY DUS TEST

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ABSTRACT

*Safflower (*Carthamus tinctorius* L) is an important oil seed crop of the world. Information on diversity for different traits of different species had an immense value in the genetic improvement of cultivated safflower. The experimental materials for morphological characterization consisting of 3 species viz., *C. palaestanius*, *C. creticus* and *C. tinctorius*, which were grown in six rows plot. The morphological characterizations of safflower were carried as per the DUS test guidelines suggested by Protection of Plant Varieties and Farmers Rights Authority. The observations were recorded for 21 different plant characters and were reported in length. This study will be useful for breeders, researchers and farmers to identify the safflower species for choosing and conserving beneficial genes for improvement of safflower and also to seek protection under Protection of Plant Varieties and Farmer's Rights Act.*

KEY WORDS:*C. creticus, C. palaestanius, C. tinctorius, characterization, DUS test, safflower*

INTRODUCTION

Safflower (*Carthamus tinctorius*) is an important oil seed crop of the world. The origin of safflower is considered as Asian and African continent (India, Afghanistan, and Ethiopia). The genus *Carthamus* consists of 25 species, distributed worldwide. Among the 25 different safflower species, the cultivated safflower grown across the world is only *Carthamus tinctorius* L.

Being signatory to the General Agreement on Trade and Tariffs, Government of India has enacted its *sui generis* system Protection of Plant Varieties and Farmers Right Act (PPV&FRA), 2001 for providing protection to plant varieties based on distinctiveness, uniformity and

stability (DUS) test apart from novelty. Therefore the characterization of a variety is prerequisite. Identification of plant varieties of common knowledge is essential for the protection of new plant varieties. Article 15.3(b) of the PPV&FR Act states that the new variety must be clearly distinguishable by one or more essential characters from any variety whose existence is a matter of common knowledge at the time of seeking protection. The uniqueness of a variety is to be established by the test called DUS. The characterization of 3 safflower species has not been done up to today; three species were characterized in different manner according to DUS test. Keeping in view of these facts, the present investigation was planned to

characterize a set of 3 species of safflower, to understand *in situ* variability of different agro-morphological traits and interrelationship among them.

MATERIALS AND METHODS

Three species, *C. tinctorius*, *C. creticus* and *C. palaestanius* of safflower (Plate 1) were grown in a six row plot at the K. K. Wagh College of Agriculture and Agricultural Biotechnology, Nashik, Maharashtra, India Kharif 2012. The observation of various characteristics was recorded in 5 randomly selected plants in each three species at different stages of growth with appropriate procedures as per the DUS test guidelines of PPV & FR Act, 2001 (<http://www.plantauthority.gov.in>).

Like UPOV, in PPV and FR Act, a variety must fulfil the criteria of Distinctiveness, Uniformity, Stability and novelty (if new) so as to get protection of varieties released in these species of safflower under this act.

RESULTS AND DISCUSSION

There is some work was done on the morphological characterization of the hybrids and its parents of safflower (Rajendra Prasad *et al.*, 2003), but no study on indigenous or wild species of safflower was done for comparative analysis. Therefore, the morphological characterization of three species of safflower was done by growing them in six row plot during Kharif 2012 following DUS guidelines.

The cursory assessment of data of different morphological traits as per DUS characterization (Table 1) revealed that all three species screened exhibited first leaf blade length, width and their ratio in the maximum grade as per the DUS characterization. The first leaf dentations or overall leaf dentations was observed to be very strong in *C. creticus*, whereas strong in

C. palaestanius and *C. tinctorius*. Similarly, *C. creticus* was very late in time of 50 per cent of flowering, while *C. palaestanius* and *C. tinctorius* were medium in flowering. There is no difference in petal colour and change in petal colour at faded stage in all the three species i.e. petal colour was yellow and it was changed to orange at faded stage. Length of blade of mid leaf was observed to be medium in length in *C. palaestanius* and *C. tinctorius*, whereas in *C. creticus*, it was categorized as long. Width of blade of mid leaf was observed to be medium in length in *C. palaestanius* and *C. tinctorius*, whereas in *C. creticus*, it was categorized as very long. The ratio of mid leaf blade (length/width) was characterized as very high in all the three species. Similarly, leaf was obovate in shape in all three species. Number of spines on leaf was medium in *C. palaestanius*, many in *C. tinctorius* and dense in *C. creticus*.

Length of outer involucre bract of main capitula (cm) was observed to be medium in all the three species, whereas width of outer involucre bract of main capitula (cm) was short in *C. creticus* and medium in *C. palaestanius* and *C. tinctorius*, while ratio of length/width outer involucre bract of main capitula (cm) was medium in *C. creticus* and high in *C. palaestanius* and *C. tinctorius*. Number of spines on outer involucre bract of main capitula was found dense in *C. creticus* and sparse in *C. palaestanius* and *C. tinctorius*. Diameter of main capitula (cm) was small in all the species.

Height of insertion of first branch in plant was recorded in the range of short in *C. creticus* and *C. palaestanius* and medium in *C. tinctorius*. Length of longest primary branch on plant was short in *C. creticus* and very long in *C.*

palaestanius and *C. tinctorius*. Height up to main capitula of plant was observed to be short in *C. creticus*, tall in *C. palaestanius* and very tall in *C. tinctorius*.

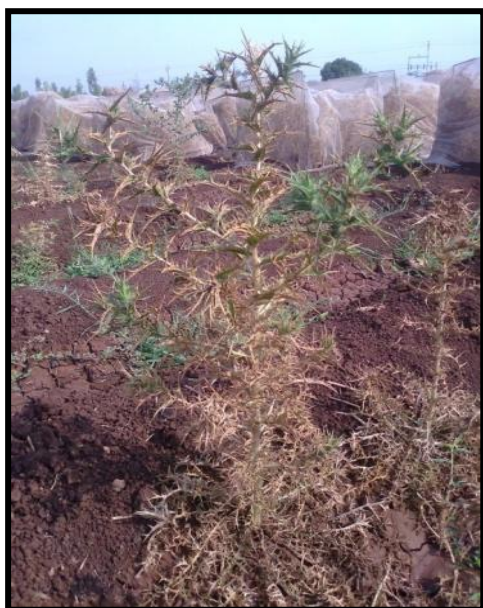
CONCLUSION

Morphological characterization of three indigenous species of safflower helps the plant breeders, researchers and farmers to identify these species for choosing and conserving beneficial genes for improvement of safflower and also to seek protection under Protection of

Plant Varieties and Farmer's Rights Act.

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C. tinctorious



C. creticus



C. Palaestanicus

Plate 1: Various species of safflower

Table 1: Morphological characterization of three safflower species as per DUS guidelines

Sr.	Characteristics	States		<i>C.tintorius</i>	<i>C.creticus</i>	<i>C.palaestanius</i>
1	First leaf : Length of blade (cm)	Very long (>12)	9	16.5	19.85	18.78
2	First leaf : Width of blade (cm)	Very broad (>3.0)	9	5.20	5.65	4.02
3	First leaf : Ratio (Length/width of blade)	Very high (>4.5)	9	10.85	12.75	11.4
4	First leaf : Dentations	Strong Very strong	7 9	Strong -	- VeryStrong	Strong -
5	Plant : Time of 50% flowering (days)	Medium (76-85) Very late (>95)	5 9	76 -	- 145	79 -
6	Petal : Colour	Yellow	3	Yellow	Yellow	Yellow
7	Petal : Change of colour (Faded stage)	Orange	5	Orange	Orange	Orange
8	Mid Leaf : Length of blade (cm)	Medium (8.1-12) Long(12.1-16)	5 7	8.35 -	- 12.50	9.40 -
9	Mid Leaf : Width of blade (cm)	Broad(4.1-5) Very broad (>5)	7 9	4.15 -	- 5.35	4.68 -
10	Mid Leaf : Ratio (Length/width of blade)	Very high (>4.5)	9	6.25	8.93	9.31
11	Leaf : Shape	Obovate	4	Obovate	Obovate	Obovate
12	Leaf : Number of spines	Medium Many Very many	5 7 9	- Many -	- - Very many	Medium - -
13	Leaf : Dentations	Strong Very strong	7 9	Strong -	- Very Strong	Strong -
14	Capitulum : Length of outer involucre bract of main capitula (cm)	Short (<2.5) Medium (2.5-5.0)	3 5	- 4.95	- 3.60	- 4.52
15	Capitulum : Width of outer involucre bract of main capitula (cm)	Short (<1.5) Medium (1.5-2.0)	3 5	- 1.60	1.45 -	- 1.78
16	Capitulum : Ratio of length/width of outer involucre bract	Medium (2.0-3.0) High (>3.0)	5 7	- 3.28	2.53 -	- 3.15
17	Capitulum : Number of spines on outer involucre bract of main capitula	Sparse Dense	3 5	Sparse -	- Dense	Sparse -
18	Capitulum : Diameter of main capitula (cm)	Small (<2.0)	3	1.85	Not flower till April10	1.92
19	Plant : Height of insertion of first branch (From ground level) (cm)	Short (6-15) Medium (16-25)	3 5	- 17.60	8.10 -	12.6 -
20	Plant : Length of longest primary branch	Short (40-45) Very long (>55)	3 9	- 68.50	42.6 -	- 74.8
21	Plant : Height upto main capitula (cm)	Short (51-60) Tall (71-80) Very tall (>80)	3 7 9	- - 85.75	54.4 - -	- 79.7 -

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