Plant Archives
Journal home page: www.plantarchives.org
DOI Url: https://doi.org/10.51470/PLANTARCHIVES.2021.v21.no1.041

MORPHOLOGICAL CHARACTERIZATION OF BROWN SARSON (*BRASSICA RAPA* L.) GENOTYPES FOR DUS TRAITS

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(Date of Receiving-04-10-2020; Date of Acceptance-29-12-2020)

ABSTRACT

Rapeseed and mustard , the two important oleriferous Brassicae grown in India play a magnanimous role in the national market of edible oils and meals. But the production of the crop is low due to a narrow genetic base. Much effort has been put to diversifying the oilseed breeding. The morphological characterization is the first step towards diversity analysis and conservation of plant genetic resources. A major challenge facing those involved in the testing of new plant varieties for Distinctness, Uniformity, and Stability (DUS) is the need to compare them against all those of 'common knowledge. Protection of Plant varieties and Farmer's Right Act insists on Distinctness, Uniformity, and Stability (DUS) characterization of new varieties and recommends the registration of varieties for any one specific novel character. On this backdrop, the present experiment was carried out to evaluate 54 *Brassica rapa* L. genotypes for DUS characterization under randomized complete block design (RCBD) with three replication at the experimental farm of GPB, FoA SKUAST-K, Wadura during rabi 2019-2020. The results of the study revealed wide variation in various traits among different *Brassica rapa* genotypes L. The assessment of 54 genotypes for 09 traits revealed that all the traits were informative with respect to trait expression cum characterization. The different characters studied were having great impact for selection of superior genotypes for further breeding programmes. Hence, the diversity observed among the genotypes could be utilized for cultivar improvement and germplasm conservation programs aimed at improving productivity in *Brassica rapaL*

Keywords: Brown Sarson, *Brassica rapa* L., Characterization, DUS, Morphological Traits

INTRODUCTION

Oilseed *Brassicas* have been ranked after soybean and palm oil in edible oil production and are at 5th position in the production of oilseed protein. *Brassica* species have played an important role in agriculture and contributed to the economy and health in the world. The family *Brassicaceae,* containing about 350 genera and 3500 species, is one of the ten most economically important plant families with a wide range of agronomic traits (Rich, 1991; Christopher *et al.,* 2005). The *Brassica* genus generally has been categorized into three categories viz; Mustard, rapeseed, and Cole. The *Brassicaceae* is distinguished on the basis of the presence of conduplicate cotyledons (i.e., the cotyledons are longitudinally folded around the radical) and two-segmented fruits (siliquae), which contain seeds in one or both segments with simple hairs if present (Misra, 2008a). These characteristics separate the mustard family from all other plant families. *Brassica rapa* L. is an important widely cultivated crop comprised of a genome n=10 with various forms or morphotypes such as leafy vegetables, turnips, and oilseed rape (Zhao *et al.,* 2005). At a present large number of commercial varieties are available, and their characterization, differentiation and plant varieties were made by a set of descriptors/ characters. For a new varieties of plants to be released should always fulfill the criteria of distinctness, plant protection uniformity and stability as per the guidelines prepared by UPOV. DUS testing is one of the important criteria to test in-bred lines for distinctness, uniformity, and stability (Yadav and Singh, 2010). DUS testing of cultivars is one of the requirements for granting Plant Breeders Rights (PBR) granted by PPV& FRA (2001). Morphological traits have been widely accepted in plant variety protection, registration, and patenting as their description has been found to be capable of showing both identity and distinctness (Canussi *et al.,* 1983). Characterization of morphological variability also allows breeders to identify accessions with desirable characteristics such as leaf length. Colour, hairiness, improved seed color, flower petal color, etc., and avoid duplication of accessions in germplasm collection. Traditionally, numerous morphological traits have been used to describe genotypes. The aim of the present study was to formulate an identification key and to develop

Table 1: List of genotypes used in the experiment.

S .No.	Genotype/Germplasm line	Source
01	KBSG-10	IPK, Germany
02	KBSG-92	IPK, Germany
03	KBSG-146	IPK, Germany
04	KBSG-1	IPK, Germany
05	KBSG-45	IPK, Germany
06	KBSG-18	IPK, Germany
07	KBSG-33	IPK, Germany
08	KBSG-2	IPK, Germany
09	KBSG-80	IPK, Germany
10	KBSG-128	IPK, Germany
11	KBSG-8	IPK, Germany
12	KBSG-123	IPK, Germany
13	KBSG-15	IPK, Germany
14	KBSG-147	IPK, Germany
15	KBSG-79	IPK, Germany
16	KBSG-124	IPK, Germany
17	KBSG-19	IPK, Germany
18	KBSG-29	IPK, Germany
19	KBSG-17	IPK, Germany
20	KBSG-74	IPK ,Germany
21	KBSG-5	IPK, Germany
22	KBSG-63	IPK, Germany
23	KBSG-68	IPK, Germany
24	KBSG-38	IPK, Germany
25	KBSG-112	IPK, Germany
26	KBSG-39	IPK, Germany
27	KBSG-102	IPK, Germany
28	KBSG-119	IPK, Germany
29	KBSG-141	IPK, Germany
30	KBSG-14	IPK, Germany
31	KBSG-18	IPK, Germany
32	KBSG-140	IPK, Germany
33	KBSG-120	IPK, Germany
34	KBSG-34	IPK, Germany
35	KBSG-151	IPK, Germany
36	KBSG-51	IPK, Germany
37	KBSG-111	IPK, Germany
38	KBSG-66	IPK, Germany
39	KBSG-85	IPK, Germany
40	KBSG-56	IPK, Germany
41	KBSG-64	IPK, Germany
42	KBSG-139	IPK, Germany
43	KBSG-134	IPK, Germany
44	KBSG-130	IPK, Germany
45	KBSG-127	IPK, Germany
46	KBSG-122	IPK, Germany
47	KBSG-118	IPK, Germany
48	KBSG-116	IPK, Germany

49	KBSG-114	IPK, Germany
50	KBSG-110	IPK, Germany
51	KBSG-107	IPK, Germany
52	KBSG-105	IPK, Germany
53	KBSG-103	IPK, Germany
54	KBSG-109	IPK, Germany
55	SS-1 (Check)	SKUAST-K
56	SS-2 (Check)	SKUAST-K
57	SS-3 (Check)	SKUAST-K

Table 2: Frequency distribution of DUS traits in *Brassica rapa* L. genotypes based on DUS descriptor PPV&FRA, 2001.

Characteristics	Class	Absolute Number	Frequency
Leaf colour	Light green	35	61%
	Medium green	5	9%
	Dark green	17	30%
Leaf width	Narrow(<4cm)	44	77%
	Medium(4-6cm)	13	23%
	Broad(>6cm)	-	-
Leaf length	Short(<12cm)	57	100%
	Medium(12-15cm)	-	-
	Long(>15cm)	-	-
Leaf dentation	Entire	37	65%
	Dentate	10	17.5%
	Serrate	10	17.5%
Hairiness of leaf	Present	50	88%
	Absent	7	12%
	Present	40	70%
Leaf lobes	Absent	17	30%
	Low(≤5)	10	18%
Number of lobes	Medium(6≤8)	40	70%
	Long(>8)	7	12%
	White		
Flower petal colour	Light yellow	45	79%
	Yellow	12	21%
	Orange	-	-
	Yellow	3	5%
Seed colour	Reddish brown	7	12%
	Brown	30	53%
	Dark brown	17	30%

varietal characterization as per the guidelines of PPV & FRA 2001 for *Brassica rapa* L. genotypes.

MATERIAL AND METHODS

The experimental material comprised of 54 Brown Sarson *Brassica rapa* L. genotypes collected from ITK, Germany and three(3) checks from Kashmir valley viz Shalimar sarson-1, Shalimar sarson-2, Shalimar sarson-3 (table-1). The trail was laid under Randomized Complete Block Design (RCBD)with 3 replications. The genotypes were evaluated for DUS characterization in the experimental farm of Division of GPB, at Faculty of Agriculture, SKUAST-K, Wadura during year 2019-20 by using the descriptor of PPV& FRA 2001.The characters used for DUS Characterization consists of 09 traits as per the descriptor. Each trait is represented by state of expression. The various characters studied were Leaf colour, Leaf width,Leaf length, Leaf dentation of margin, Leaf hairiness, Leaf lobes, Number of leaf lobes, flower petal colour, and Seed colour (table-2). The characters studied were recorded at proper stage. Leaf characters were recorded at full foliage stage. Seed colour character was recorded after harvest of crop. The data was put to statistical tools for analysis and interpretation of results.

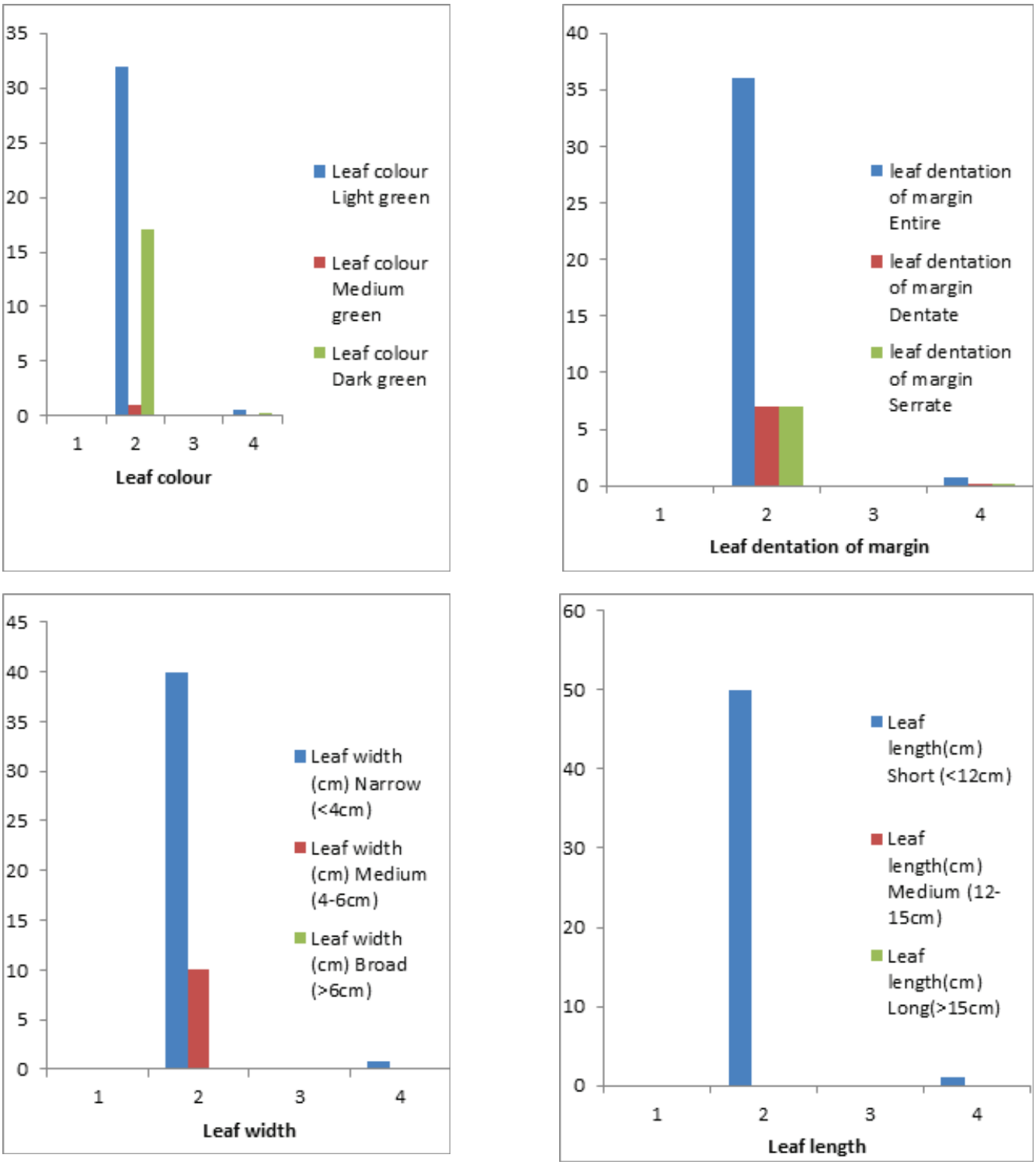

Fig 1: Graphical representation of frequency distribution of Dus traits.

RESULTS AND DISCUSSION

The *Brassica rapa* L. genotypes evaluated for DUS traits showed wide range of variability withrespect to different traits studied. The frequency distribution of DUS characters is presented in table -2.DUS characterization for fifty seven (57) genotypes revealed broad pattern of variation for all the traits recorded. Most traits recorded three classes except hairiness of leaf and leaf lobes which recorded only two classes. Flower petal colour and seed colour had highest classes viz., four indicating these traits were complex.All the plants were short for leaf length. Leaf colour was mostly light green followed by dark green and medium green. Plant exhibited mostly narrow (44%) leaf width followed by medium (23%). the plant exhibited mostly entire (65%) leaf dentation of margin followed by dentate (17.5%) and serrate (17.5%). Present leaf hairiness was found in maximum genotypes with frequency (88%) followed by absent (12%). Leaf lobes were mostly present with frequency (70%) followed by absent (30%), and most plant exhibited medium number of leaf lobes with

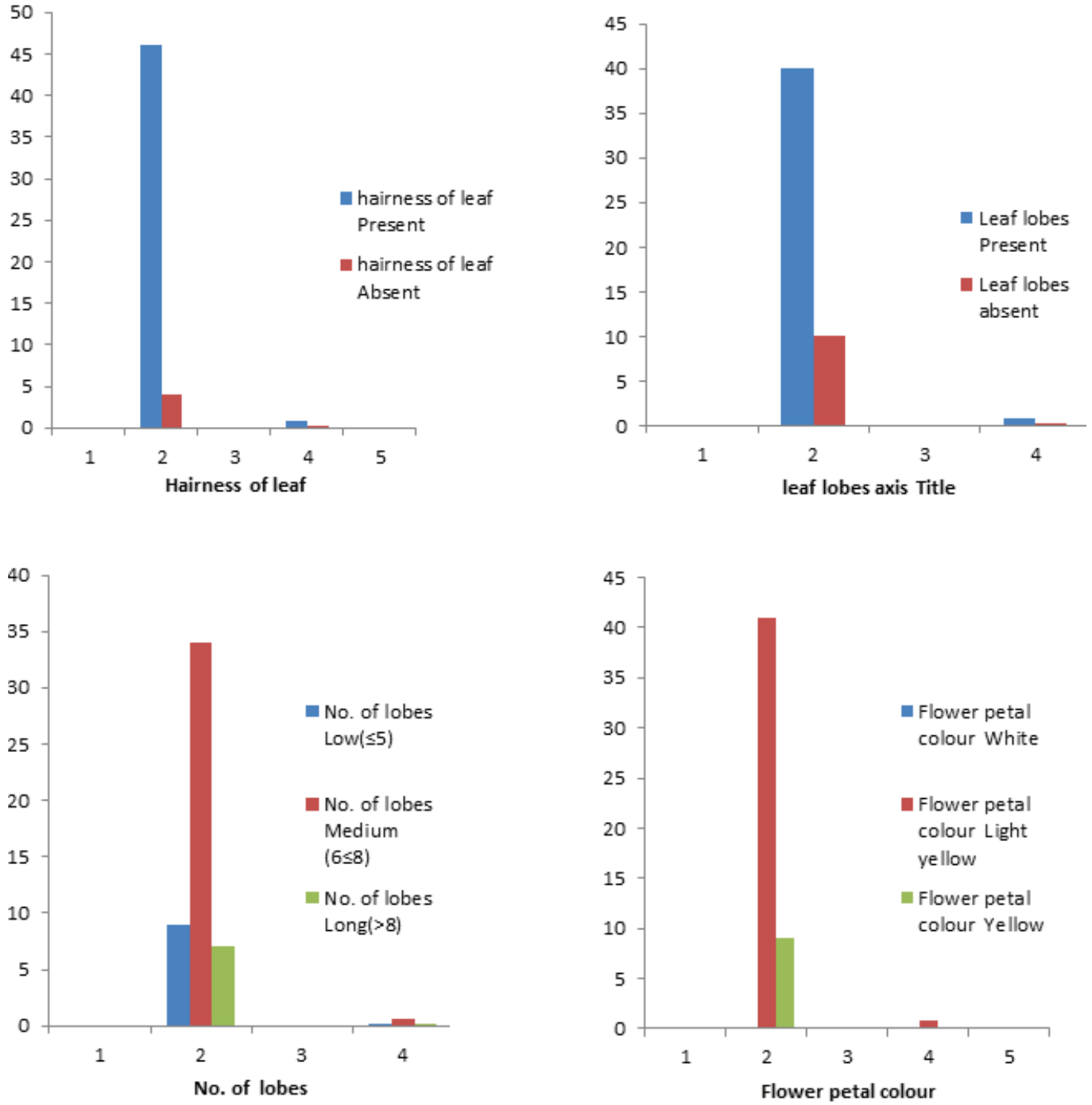

Fig 2: Graphical representation of frequency distribution of DUS traits.

frequency (70%) followed by low (18%) and long (12%). Plant mostly exhibited light yellow (79%) flower petal colour followed by yellow (21%). Seed colour was most brown with frequency (53%) followed by dark brown (30%) and reddish brown (12%).Similar observation were found in cauliflower by B. Singh(2013) and R. Avtar *et al.,* (2016).

CONCLUSION

The assessment of 54 genotypes for 09 traits DUS revealed that all the traits were informative with respect to trait expression cum characterization. The different characters studied were having great impact for selection of superior genotypes for further breeding programmes. Frequency distribution of traits for DUS characterization of *Brassica rapa* L.genotypesrevealed broad pattern of variation for all the traits recorded. Which could be better utilized in the genotypes based on their specific requirement for further breeding programmes. The diversity among the different genotypes could be utilized for cultivar improvement and germplasm conservation programs aimed at improving productivity in *Brassica rapa* L.

Acknowledgement: The first authorsincerely acknowledges the support from Head Division of Genetics and Plant Breeding, Faculty of Agriculture-Wadura, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Srinagar for providing me with the facilities in pursuit of this research program.

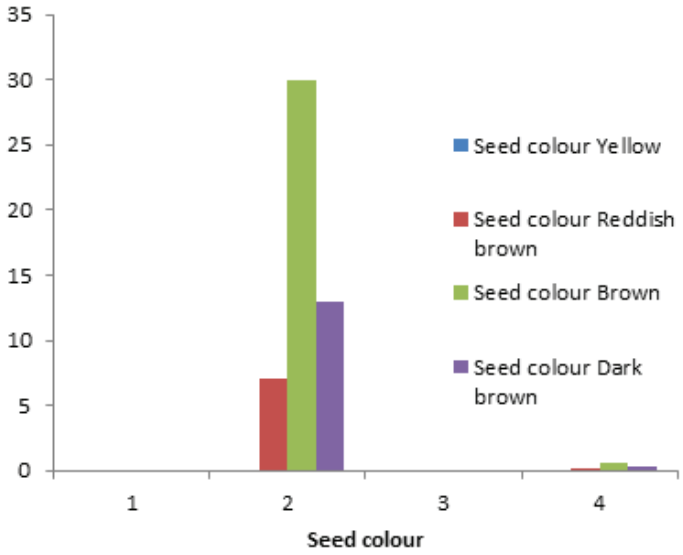

Fig 3: Graphical representation of frequency distribution of DUS traits

Competing Interest: The authors declare no conflict of interest in the publication of this manuscript.

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