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MORPHOLOGICAL CHARACTERIZATION OF LENTIL ACCESSIONS: QUALITATIVE CHARACTERS

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Abstract

Wide variability was observed for all the characters among 110 lentil accessions. Stem colour varied from normal green (45%) to purple (55%). Prominent and rudimentary tendrils were found in 60% and 40% of the accessions, respectively. Among the characters, flower colour showed the highest variation. White flower colour was observed in 49%, violet in 28%, white with blue veins in 20% accessions and the rest 3% were with blue flowers. Red cotyledon was shown by 90% while with yellow was shown by 10% of the accessions. Green, grey and brown seed coat was observed in 10, 66 and 24% of the accessions, respectively. Seed coat pattern with dots was found in 70% accessions and marbled seed coat pattern was shown by 15.5% while 14.5% did not show any seed coat pattern.

Lentil is a slender, softly pubescent, light green, annual herbaceous plant which exhibits a wide range of morphological variations in both vegetative and reproductive organs. Considerable variations among the characters for use in breeding and selection programmes have been reported (Malik *et al.* 1984, Ramgiry *et al.* 1989, Sarker and Erskine 2001, Tullu *et al.* 2001). Barulina (1930) first recorded detailed morphological descriptions of lentil landraces and species from Asia. Morphological markers like stem, flower, cotyledon and testa colours and pattern of testa and tendrils are important for testing hybridity and keeping genetic purity to be used in marker assisted selection. Targeted and more efficient utilization of germplasm by plant breeders can be achieved if the trait characteristics of accessions are known. The present study was therefore, undertaken to characterize the diverse lentil accessions collected from home and abroad on the basis of qualitative traits.

The experiments were conducted with 110 lentil accessions, which were landraces, local cultivars and phenologically adapted exotic accessions collected from home and abroad. Sources of collection with country of origin of 110 accessions have been presented in Table 1. The experiments were carried out in two consecutive years, 2006 - 07 and 2007 - 08 in the farms of Bangladesh Institute of Nuclear Agriculture (BINA) sub-station at Ishurdi and Magura. Urea, muriate of potash and triple super phosphate were applied during land preparation at the rate of 32, 77 and 32 kg/ha, respectively. The experiments were carried out following an Alpha Lattice design with three replicates. Unit plot size was 1.2 m^2 (2 m × 0.6 m). Row to row and plant to plant distances were 30 cm and 6 - 8 cm, respectively. Seeds were sown on 9 November, 2006 and

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12 November, 2007 at Ishurdi and on 10 November, 2006 and 13 November, 2007 at Magura. Intercultural operations were done as and when necessary for proper growth and development of the plants. Data were recorded from both years' experiments following Biodiversity International and ICARDA guidelines on stem pigmentation, tendril formation, flower colour, cotyledon colour, testa colour and testa pattern.

Table 1. Source of collection and country of origin of 110 lentil accessions.

Accessions	Source of collection	Origin
ILL4605 and ILL8108	ICARDA, Syria	Argentina
ILL5888, ILL8006, ILL8007, ILL8147, 955-167-1, 8406-122, BLx98005-3, x87039xL-5 and 40-50134-5	ICARDA, Syria	Bangladesh
ILL1712 and ILL2501	ICARDA, Syria	Ethiopia
ILL8605-8, ILL9995, ILL10011, ILL10020, ILL10066, ILL10067, ILL10068, ILL10069, ILL10070, ILL10071, ILL10072, ILL10073 and ILL10077	ICARDA, Syria	ICARDA
ILL2532, ILL2581, ILL2582, ILL2590, ILL2648, ILL2815, ILL3312, ILL3517, ILL3597, ILL4147 ILL5094, ILL7556, ILL7558, ILL7715, ILL8008 and ILL8109	ICARDA, Syria	Iindia
ILL8009	ICARDA, Syria	Nepal
ILL4402, ILL7162, ILL7163, ILL7164, ILL8114, ILL88527, ILL91517 and ILL98369	ICARDA, Syria	Pakistan
BINAmasur-2, BINAmasur-3, N1I-101, N1I- 424, N1M-134, N1M-149, N2M-119, N2M-214, N2M -715, N4M-402, N4M-423, N4M-433, N5I-507, N5M-338, N5M-564, E1M-606, E1M-617, E4M-941, E5M-229, E5M-501 and N5M-573	BINA, Bangladesh	Bangladesh
BARImasur-1, BARImasur-3, BARImasur-5, BARImasur-6, BLx98002-3, BLx98002-4, BLx98004-3, BLx98006-3, BLx98008, ILLx87040, L-5x37047, L-5x87272 and 10741-87012	BARI, Bangladesh	Bangladesh
ILL4703, ILL5072, ILL5098, ILL5102, ILL5108, ILL5143, ILL6305, ILL7656 and ILL8605-2	BARI, Bangladesh	ICARDA
ILL2460, ILL2475, ILL2493, ILL2507, ILL2527, ILL5113, ILL5150, DPL-44, 128xE28, P202E19 and P235E17	BARI, Bangladesh	India
BARImasur-2 and BARImasur-4	BARI, Bangladesh	Nepal
ILL6308 and ILL95052	BARI, Bangladesh	Pakistan
P114E14-136	BARI, Bangladesh	The USA

BINA = Bangladesh Institute of Nuclear Agriculture; BARI = Bangladesh Agricultural Research Institute; ICARDA = International Center for Agricultural Research in the Dry Areas. Accessions collected from Bangladesh were developed either by mutation or by hybridization at BINA or BARI.

Six different qualitative characters of 110 accessions were studied which are the important morphological markers for keeping genetic purity. Stem colour, an important morphological character, varied from normal green to purple. Green stem colour was found in 45% of the accessions and the rest 55% were with purple stem (Table 2). Most of the accessions originated from ICARDA were with purple stem. The stem colour of other accessions originated from India, Pakistan, Nepal and Ethiopia were either purple or green. During crop growth and at maturity tendril keeps the plants intermingled and the canopy upright. This allows less seed loss in

mechanical harvest. Depending upon the length it may be prominent with long tendril or rudimentary with short or no tendril. Prominent tendril was found in 60% accessions and rudimentary with 40% accessions (Table 2). White flowers were observed in 49% accessions, violet flowers were found in 28% accessions, white with blue veins flowers were observed in 20% accessions and the rest 3% were with blue flowers (Table 2). All the accessions developed at BINA were observed with white flower. Muehlbauer *et al*. (1985) reported white, pink, purple, light purplish blue or pale blue flower which was found consistent with the present study. This is an important trait for testing hybridity in crossing programme and keeping varietal purity at final

Table 2. Percentages of accessions showing different characters in different plant parts.

Plant parts	%	Characters
Stem	55	Green
	45	Purple
Flowers	49	White
	28	Violet
	20	White with blue vein
	3	Blue
Seed coat	66	Grey
	24	Brown
	10	Green
Cotyledon	90	Yellow
	10	Red
Seed coat pattern	70.0	Dot
	15.5	Marble
	14.5	No pattern
Tendril formation	60	Prominent
	40	Rudimentary

level. There are two kinds of cotyledon in lentil, red and yellow. Cotyledon with red colour in lentil is preferred in Bangladesh and other countries of Indian subcontinent, Ethiopia, Eritrea, Sudan, Egypt, Turkey, Syria, etc**.** Yellow cotyledon lentil is preferred by the consumers' of North Africa, Central Asia and Caucasus countries. Therefore, cotyledon colour is an important trait for breeding lentil based on consumers' preference in different region. The 99 (90%) accessions were observed with red cotyledon while the rest 11 (10%) were with yellow cotyledon (Table 2). The cotyledon colour may be red, yellow or green. The green cotyledon turns yellow after a period of storage (Kay 1979). Eleven accessions (10%) were observed with green seed coat colour while 66% were with grey and the rest 24% were with brown seed coat colour (Table 2). However, the seed coat colour can be pink, yellow, green, dark green, grey, brown or black (Muehlbauer *et al.* 2002). Free of seed coat pattern was found in 14.5% accessions, 70% accessions produced dots and the remaining 15.5% accessions were found with marbled (Table 2). Muehlbauer *et al*. (2002) reported dark brown or black spots, speckling or mottling in some genotypes.

In conclusion, it can be said that plant breeders can use these genetic variations to make decision regarding the choice for selecting superior genotypes for improvement or to be utilized as parents for the development of future cultivars through hybridization. Furthermore, important morphological markers like stem, flower and cotyledon colours can also be used for testing hybridity and keeping genetic purity at final level.

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