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Characterization of bread wheat (*Triticum aestivum* L.) genotypes through seed morphology

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Abstract

The investigation was undertaken at the Department of Seed Science and Technology, Junagadh Agricultural University, Junagadh, during *rabi* 2017-18 to characterize 30 bread wheat genotypes released for general cultivation in Gujarat at state level as well as at the National level in central India based on the chemical tests. Based on the seed colour, all the 30 genotypes were having amber colour seed. On the basis of seed shape, genotypes were classified into ovate (12 genotypes), oblong (14 genotypes), elliptical (2 genotypes) and round (2 genotypes). On the basis of seed size, genotypes were grouped into medium seed size (5 genotypes), bold seed size (17 genotypes) and very bold seed size (8 genotypes). On the basis of seed hardness, genotypes were grouped into hard (20 genotypes) and semi-hard (10 genotypes). Based on the seed germ width, genotypes were grouped into medium (20 genotypes), wide (6 genotypes) and narrow (4 genotypes) seed germ width types. The genotypes were grouped based on the seed crease into three groups, as medium (14 genotypes), shallow (13 genotypes) and deep (3 genotypes) seed crease types. Based on the brush hair length, genotypes were grouped as short (18 genotypes), medium (9 genotypes) and long (3 genotypes) brush hair length types.

Keywords: Bread wheat, characterization, morphology, seed

Introduction

Wheat is a type of grass grown all over the world for its highly nutritious and useful grain. It is one of the annual or biennial grass having erect flower spikes and light brown grains. It is the world's largest cereal crop. It has been described as the 'King of cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade.

Maintenance of genetic purity of varieties is of primary importance for preventing varietal deterioration during successive regeneration cycles and for ensuring varietal performance at an expected level. The aspects of Distinctness, Uniformity and Stability (DUS) are fundamental for characterization of varieties. In countries having Plant Breeder's Right (PBR) in operation, a new variety is registered only, if it is distinct from other varieties, uniform in its characteristics and genetically stable. In the light of the above facts, the present study on the documentation of characters for wheat genotypes was planned with the objective to identify stable diagnostic characteristics of seed morphology of wheat genotypes.

Materials and Methods

The experiment was conducted in the Seed Testing Laboratory of the Department of Seed Science and Technology, Junagadh Agricultural University, Junagadh, during *rabi* 2017-18 to study the genotype characterization in 30 bread wheat genotypes *viz.*, AKAW 4899, DBW 154, DBW 88, DWAP 1530, DWAP 1531, GW 2014-562, GW 451, GW 455, GW 463, HD 2967, HI 1600, HPW 360, HUW 666, HUW 677, KBRL 78-2, KBRL 79-2, LBPY 2013-3, MP 3336, NIAW 1994, NIAW 2349, PBW 681, PBW 698, PHSL 11, RAJ 4238, RAJ 4350, UP 2891, UP 3000, VL 967, VL 977 and WS 1503 released for general cultivation in Gujarat at state level as well as at the National level in central India based on the seed morphological characters. Seed morphological characters *viz.*, seed colour, seed shape, seed size (test weight) (g), seed hardness, seed germ width, seed crease and brush hair length were measured as per the guidelines of DUS testing (PPV & FR Authority, GOI, New Delhi). Of all the seed morphological characters, seed size (test weight) was the only quantitative character, which was analyzed following analysis of variance for Completely Randomized Design as per the method of Cochran and Cox (1957) [4].

Results and Discussion

Based on the variation in seed morphological characteristics, the genotypes were grouped into different categories (Table 1 and 2). Based on the seed colour, all the 30 genotypes were having amber colour seed. On the basis of seed shape, genotypes were classified into ovate (12 genotypes), oblong (14 genotypes), elliptical (2 genotypes) and round (2 genotypes). On the basis of seed size, genotypes were grouped into medium seed size (5 genotypes), bold seed size (17 genotypes) and very bold seed size (8 genotypes). On the basis of seed hardness, genotypes were grouped into hard (20 genotypes) and semi-hard (10 genotypes). Based on the seed germ width, genotypes were grouped into medium (20 genotypes), wide (6 genotypes) and narrow (4 genotypes) seed germ width types. The genotypes were grouped based on the seed crease into three groups, as medium (14 genotypes), shallow (13 genotypes) and deep (3 genotypes) seed crease types. Based on the brush hair length, genotypes were grouped as short (18 genotypes), medium (9 genotypes) and long (3 genotypes) brush hair length types.

The seed morphological characteristics helped in identifying and grouping of the genotypes. On the basis of seed morphology, wheat genotypes identification keys are presented in the Figure 1. The genotypes *viz.*, AKAW 4899 and PBW 681 were having similar seed morphology *viz.*, amber seed colour, ovate seed shape, bold seed size, hard seed, medium seed germ width, medium seed crease and short brush hair length. The genotypes HUW 666, HUW 677, KBRL 78-2 and NIAW 1994 were differing from above genotypes with respect to seed germ width, seed crease and brush hair length. HUW 666 was having medium seed germ width, medium seed crease and medium brush hair length. HUW 677 was having medium seed germ width, shallow seed crease and long brush hair length. KBRL 78-2 was having medium seed germ width, shallow seed crease and medium brush hair length. NIAW 1994 was having wide seed germ width, shallow seed crease and short brush hair length.

The genotypes DBW 88 and VL 967 were having amber seed colour, oblong seed shape, bold seed size, hard seed, medium seed germ width, medium seed crease and short brush hair length. The genotypes DWAP 1530, KBRL 79-2, NIAW 2349 and PBW 698 were differing from above genotypes with respect to seed germ width, seed crease and brush hair length. DWAP 1530 was having medium seed germ width, medium seed crease and medium brush hair length. KBRL 79-2 was having wide seed germ width, shallow seed crease and medium brush hair length. NIAW 2349 was having narrow seed germ width, deep seed crease and medium brush hair length. PBW 698 was having wide seed germ width, medium seed crease and short brush hair length.

HPW 360 and RAJ 4238 were having amber seed colour, oblong seed shape, bold seed size, semi-hard seed and short brush hair length, but differing in seed germ width and seed crease. HPW 360 was having wide seed germ width and

shallow seed crease, while RAJ 4238 was having medium seed germ width and medium seed crease. The genotypes *viz.*, HI 1600 and LBPY 2013-3 were having similar seed morphology *viz.*, amber seed colour, round seed shape, bold seed size, hard seed, medium seed germ width, shallow seed crease and short brush hair length. The genotype PHSL 11 was having amber seed colour, elliptical seed shape, bold seed size, hard seed, narrow seed germ width, shallow seed crease and short brush hair length.

The genotypes HD 2967, UP 3000 and VL 977 were having amber seed colour, ovate seed shape and medium seed size, but were differing in seed hardness, seed germ width, seed crease and brush hair length. HD 2967 was having semi-hard seed, wide germ width, medium seed crease and medium brush hair length. UP 3000 was having hard seed, medium seed germ width, medium seed crease and short brush hair length. VL 977 was having semi-hard seed, narrow seed germ width, shallow seed crease and short brush hair length. DBW 154 was having amber seed colour, elliptical seed shape, medium seed size, hard seed, narrow seed germ width, shallow seed crease and short brush hair length. DWAP1531 was having amber seed colour, oblong seed shape, medium seed size, hard seed, medium seed germ width, deep seed crease and short brush hair length.

The genotypes RAJ 4350 and UP 2891 were having amber seed colour, ovate seed shape, very bold seed size, semi-hard seed and medium seed germ width, but were differing in seed crease and brush hair length. RAJ 4350 was having shallow seed crease and medium brush hair length. UP 2891 was having medium seed crease and short brush hair length. The genotype GW 2014-562 was having amber seed colour, ovate seed shape, very bold seed size, hard seed, wide seed germ width, deep seed crease and medium brush hair length. The genotypes GW 451, GW 455, MP 3336 and WS 1503 were having amber seed colour, oblong seed shape, very bold seed size, semi-hard seed and medium seed germ width, but were differing in seed crease and brush hair length. GW 451 was having medium seed crease and long brush hair length. GW 455 was having medium seed crease and medium brush hair length. MP 3336 was having shallow seed crease and short brush hair length. WS 1503 was having medium seed crease and short brush hair length. The genotype GW 463 was having amber seed colour, oblong seed shape, very bold seed size, hard seed, medium seed germ width, shallow seed crease and long brush hair length.

Similar characterization and grouping of wheat genotypes based on seed morphological characters were made by Naseem *et al.* (2007) ^[10], Khan *et al.* (2009) ^[7], Mansing (2010) ^[9], Ahmad *et al.* (2013) ^[2] and Abubaker *et al.* (2013) ^[1] in wheat; Semwal *et al.* (2014) ^[11], Kalyan *et al.* (2017) ^[8] and Ghosh *et al.* (2018) ^[6] in rice; and Chavan (2010) ^[3] in soybean; Suhasini (2006) ^[12] in sesame; and Deepak *et al.* (2018) ^[5] in sorghum.

Table 1: Identification and grouping of wheat genotypes based on seed colour, seed shape and seed size (test weight).

Genotypes	Seed Colour	Seed Shape	Seed Size (Test Weight) (g)	Groups (Seed Size)
AKAW 4899	Amber	Ovate	41.56	Bold
DBW 154	Amber	Elliptical	39.32	Medium
DBW 88	Amber	Oblong	41.17	Bold
DWAP 1530	Amber	Oblong	42.84	Bold
DWAP 1531	Amber	Oblong	38.35	Medium
GW 2014-562	Amber	Ovate	46.65	Very bold
GW 451	Amber	Oblong	45.76	Very bold
GW 455	Amber	Oblong	46.05	Very bold

GW 463	Amber	Oblong	45.56	Very bold
HD 2967	Amber	Ovate	38.38	Medium
HI 1600	Amber	Round	43.29	Bold
HPW 360	Amber	Oblong	44.36	Bold
HUW 666	Amber	Ovate	43.29	Bold
HUW 677	Amber	Ovate	44.40	Bold
KBRL 78-2	Amber	Ovate	43.09	Bold
KBRL 79-2	Amber	Oblong	41.50	Bold
LBPY 2013-3	Amber	Round	41.19	Bold
MP 3336	Amber	Oblong	45.64	Very bold
NIAW 1994	Amber	Ovate	43.48	Bold
NIAW 2349	Amber	Oblong	40.31	Bold
PBW 681	Amber	Ovate	41.80	Bold
PBW 698	Amber	Oblong	43.39	Bold
PHSL 11	Amber	Elliptical	41.12	Bold
RAJ 4238	Amber	Oblong	41.94	Bold
RAJ 4350	Amber	Ovate	46.40	Very bold
UP 2891	Amber	Ovate	45.75	Very bold
UP 3000	Amber	Ovate	39.20	Medium
VL 967	Amber	Oblong	40.79	Bold
VL 977	Amber	Ovate	39.55	Medium
WS 1503	Amber	Oblong	45.40	Very bold
Mean			42.71	
S.Em ±			0.32	
C. D. at 5%			0.93	
CV %			1.33	

Note: Seed Size (Test weight) g

Low	:	< 35 g
Medium	:	35 to 40 g
Bold	:	40 to 45 g
Very bold	:	> 45 g

Table 2: Identification and grouping of wheat genotypes based on seed hardness, seed germ width, seed crease and brush hair length.

Genotypes	Seed Hardness	Seed Germ Width	Seed Crease	Brush Hair Length
AKAW 4899	Hard	Medium	Medium	Short
DBW 154	Hard	Narrow	Shallow	Short
DBW 88	Hard	Medium	Medium	Short
DWAP 1530	Hard	Medium	Medium	Medium
DWAP 1531	Hard	Medium	Deep crease	Short
GW 2014-562	Hard	Wide	Deep crease	Medium
GW 451	Semi hard	Medium	Medium	Long
GW 455	Semi hard	Medium	Medium	Medium
GW 463	Hard	Medium	Shallow	Long
HD 2967	Semi hard	Wide	Medium	Medium
HI 1600	Hard	Medium	Shallow	Short
HPW 360	Semi hard	Wide	Shallow	Short
HUW 666	Hard	Medium	Medium	Medium
HUW 677	Hard	Medium	Shallow	Long
KBRL 78-2	Hard	Medium	Shallow	Medium
KBRL 79-2	Hard	Wide	Shallow	Medium
LBPY 2013-3	Hard	Medium	Shallow	Short
MP 3336	Semi hard	Medium	Shallow	Short
NIAW 1994	Hard	Wide	Shallow	Short
NIAW 2349	Hard	Narrow	Deep crease	Medium
PBW 681	Hard	Medium	Medium	Short
PBW 698	Hard	Wide	Medium	Short
PHSL 11	Hard	Narrow	Shallow	Short
RAJ 4238	Semi hard	Medium	Medium	Short
RAJ 4350	Semi hard	Medium	Shallow	Medium
UP 2891	Semi hard	Medium	Medium	Short
UP 3000	Hard	Medium	Medium	Short
VL 967	Hard	Medium	Medium	Short
VL 977	Semi hard	Narrow	Shallow	Short
WS 1503	Semi hard	Medium	Medium	Short

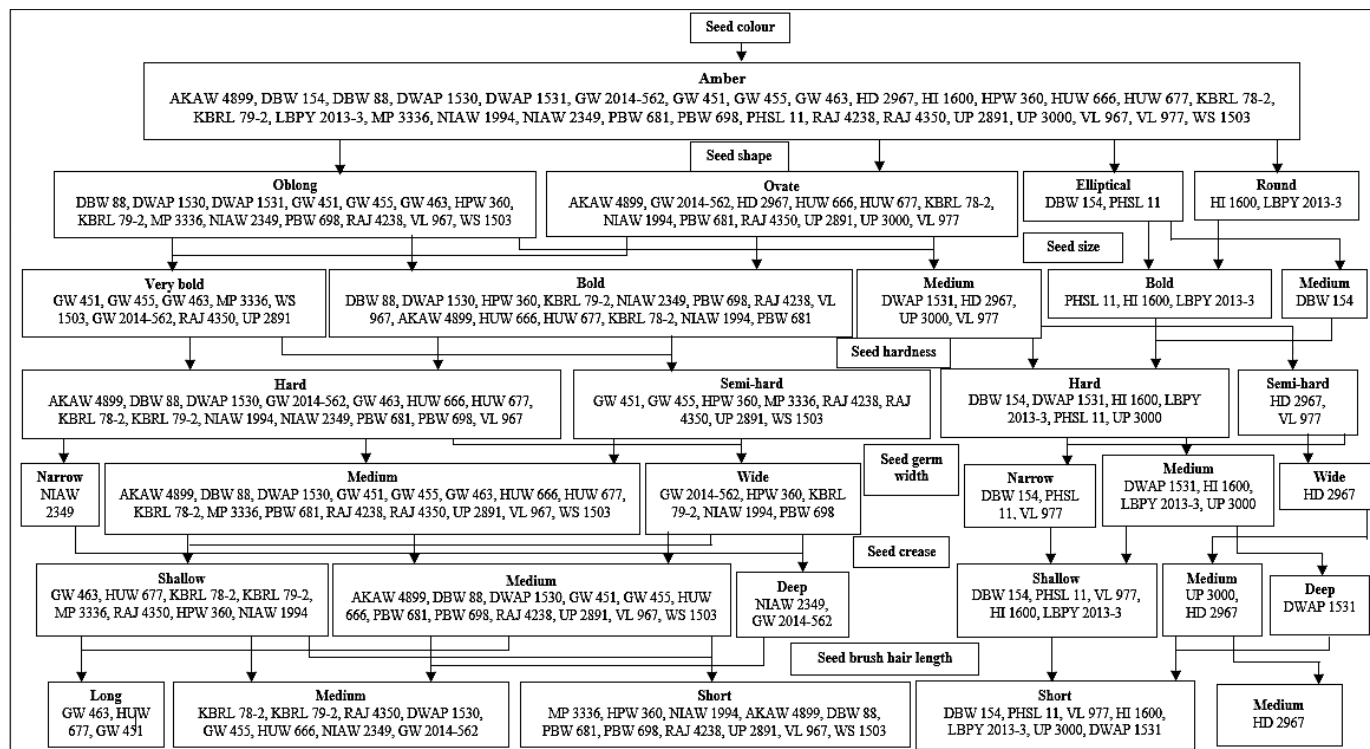


Fig 1: Wheat genotypes identification keys on the basis of seed morphological characters.

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