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PHENOTYPIC CHARACTERIZATION OF FIVE WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES

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ABSTRACT

To assess the phenotypic variation among five genotypes (A-08, A-09, A-17, A-25 and S-14) of wheat (*Triticum aestivum* L.) a field experiment was carried out at University College of Agriculture Sargodha, Sargodha during the year of 2013-14. For visual assessment, qualitative morphological characters of plant (growth habit pattern, foliage color, flag leaf attitude, spike color, spike shape, spikelet density, awn attitude and awn length) and seed (color, shape, germ width, brush hair length and seed crease) were used to identify the genotypes and variation was observed in all the traits under study. But identification through morphological markers is not a reliable method for identification of varieties, accessions or cultivars.

Keywords: Wheat, Phenotypic Variation, Morphological Markers, Seed

1. INTRODUCTION

Identification and characterization of a variety is crucial for existing and newly developed genotypes for their maintenance, multiplication and seed certification because phenotypic as well as genotypic variations exist among different varieties of same crop. Under the proposed New Seed Bill, 2001, all the new varieties have to be registered based on the criteria of novelty, distinctness, uniformity and stability (DUS). Hence, there is a dire need to develop and standardize the criteria for phenotypic characterization and identification of gene markers of the variety/ hybrid for genetic variations.

Arunkumar *et al*. (2004) reported wide range of variation in morphology of seed, seedling and plant of different cultivars, genotypes or varieties of same crop. Therefore, the present study was conducted to explore the phenotypic variations among five genotypes (A-08, A-09, A-17, A-25 and S-14) of wheat (*Triticum aestivum* L.) crops through evaluating morphological characters of seed and whole plant as well.

Morphological characterization of varieties is a traditional practice, based on visual assessment and can be performed immediately without using any equipment. The morphological characters of seed were studied includes color, shape, germ width, brush hair length and seed crease. Morphological characters of plant include growth habit pattern, foliage color, flag leaf attitude, spike color, spike shape, spikelet density, an attitude and awn length.

2. MATERIALS AND METHODS

A field study was carried out to characterize five genotypes (A-08, A-09, A-17, A-25 and S-14) of wheat (*Triticum aestivum* L.) crops at University College of Agriculture Sargodha, Sargodha during the year of 2013-14. The experiment was designed in a randomized complete block design with three replicates. Seeds of test genotypes were collected from National Institute of Agriculture Research Center (NARC) and seeds were sown on 21st November 2013, by a seed drill on seed beds. The distance of 20 cm was maintained from row to row. After each entry, gap of 1 row was also maintained in each replicate. After attaining complete maturity, the crop was harvested on 26th May, 2014.

Morphological assessment of plant was performed at developmental stages of crop and of seed was performed after harvest of crop. Digital images were also collected for each studied character of all genotypes.

3. RESULTS

The results obtained from characterization and identification of wheat genotypes through morphological characters of plant and seed are as presented here.

4. PLANT MORPHOLOGY

Data presented in table 1 and figures 1 (a-e) to 8 (a-e) shows the phenotypic variation in plant morphology of five wheat genotypes.

a. Plant Growth Habit

At tillering stage, plant growth habit was observed from angle formed by leaves and tillers with root. On the basis of plant growth habit, genotypes were classified as erect (900), semi-erect (450) and intermediate (600). In present study, genotype A-08 was intermediate (Fig, 1a) A-09 and A-25 were erect (Fig,1b & 1d) while A-17 and S-14 were semi-erect (Fig,1c & 1e) in growth habit.

b. Foliage Color

Plant foliage color was observed by visual assessment at tillering stage. Observations recorded in table 1 show that A-17 has yellowish green foliage color (Fig, 2c), the genotypes A-09 and S-14 have shown light green foliage (Fig, 2b & 2e) while dark green foliage were observed in genotype A-08 and A-25 (Fig, 2a & 2d).

c. Flag Leaf Attitude

Flag leaf attitude was assessed at heading stage from angle between flag leaf and stem. Data presented in table 1 depicts that the flag leaf has erect appearance in genotype A-08 (Fig, 3a) and semi-erect appearance in two genotypes A-09 and A-25 (Fig, 3b &4d) while semi-drooping in A-17 (Fig, 3c) and drooping in S-14(Fig, 3e).

d. Spike color and shape

Color and shape of spike was observed at maturity. The spike color was dark brown in genotype A-08(Fig, 4a) yellow in A-09 (Fig, 4b) white in A-25 (Fig, 4d) light brown in genotype A-17 (Fig, 4c) and reddish brown in S-14 (Fig, 4e). Shape of spike was tapering in A-08, A-17 and S-14 (Fig, 5a, 5c & 5e) and parallel in A-09 and A-25 (Fig, 5b & 5d).

e. Spikelet's Density Spike-1

Data presented in table 1 reveals that genotypes A-09 and S-14 have dense Spikelet's per spike (Fig, 6b & 6e) while less spikelet density was observed in the spikes of genotypes A-08, A-17 and A-25 (Fig, 6a, 6c & 6d).

f. Awn Color

Table 1 describes that awn color, length and attitude also vary from genotype to genotype. White colored awns were observed in two genotypes i.e. A-09 and A-25 (Fig, .7b & 7d). The color of awn was brown in A-17 and S-14 (Fig, 7c & 7e) while dark brown in A-08 (Fig, 7a).

g. An Attitude

It is revealed from table 1 that spreading (non-straight and irregular) and oppressed (straight and regular) awn attitude was present in different wheat genotypes. The spreading appearance of the awns was observed in genotypes (A-08, A-17, A-25 and S-14 (Fig, 7a, 7c, 7d & 7e) with exception the genotype A-09 in which the emergence of awns was oppressed (Fig, 7b).

h. Awn Length

The information recorded in table 1 further indicates that significant variation exists in length of awns among five genotypes. Awn length was short in A-08 and A-25 (Fig, 8a & 8d) and long in A-09 and S-14 (Fig, 8b & 8e) while Medium awn length was only observed in genotype A-17 (Fig, 8c).

i. Spikelet's Density Spike-1

Data presented in table 1 reveals that genotypes A-09 and S-14 have dense Spikelet's per spike (Fig, 6b & 6e) while less spikelet density was observed in the spikes of genotypes A-08, A-17 and A-25 (Fig, 6a, 6c & 6d).

j. Seed Morphology

Data presented in table 2 and figures 9 (a-e) to 11 (a-e) shows the phenotypic variation in seed morphology of five wheat genotypes.

k. Seed color

According to the observed color of seed the selected wheat lines were classified into two categories i.e. genotypes having white colored seeds (A-17, A-25 and S-14) and genotypes having red colored seeds (A-08 and A-09).

l. Seed Shape

Figure 9 a-e show that seeds of genotype A-08 are ovate in shape while seeds of genotypes A-09, A-17 and A-25 have oblong shape. Elliptical seed shape was observed in genotype S-14.

m. Seed Size (Test Weight)

According to TKW (1000 grain weight) A-08 and A-25 were bold in seed size, A-09 was very bold while A-17 and S-14 were medium bold and low bold respectively.

n. Seed Germ Width

The data recorded in the table 2 reveals that the seeds of genotypes A-08 and A-17 have medium germ width. The structure of seed germ width in genotypes A-25 and S-14 was wide while in case of genotype A-09 it was wide and deep also (Fig, 10b, 10d & 10e).

o. Seed Crease

Seed crease present on the ventral side of seed of wheat is also an important character that can be used for identification or characterization of wheat genotypes from a population. The observations recorded in table 2 indicate that genotypes A-08 and A-25 have medium seed crease while A-09 and S-14 have deep creased seeds. The shallow crease of seeds was observed only in genotype A-17.

p. Seed Brush Hair Length

In the present investigation, two genotypes A-08 and A-17 have short brush hairs as compare to A-09, A-25 and S-14 as they have long brush hairs (Fig, 11a- e). No genotype was characterized in which brush hairs are absent during the present research work.

3. Discussion

The varietal description for identification of different varieties of a crop has gained critical importance in national and international seed programmers. Therefore, there is a dire need to develop fast and reliable methods and identifiable characters for the purpose. The distinct and unique characters of a variety may be morphological, chemical or molecular in nature can be used for varietal identification.

In the present study, an effort was made to characterize some of the promising wheat lines on the basis of morphological characters of plant and seeds.

Use of plant morphological characters for varietal identification is a classical approach and has indicated closest similarity of genotype A-09 and A-25 having same growth habit, flag leaf attitude, spike color, spike shape and awn color but were distinct in foliage color, an attitude and awn length. Similarly, genotype A-17 and S-14 have shown similarity in growth habit, spike shape, awn color and attitude but show variation in foliage color, flag leaf attitude, spikelet density and awn length.

Thangvel *et al*., 2005 carried out the characterization of 85Durum wheat (*Triticum turgidum* var. Durum) accessions by analysis of 19 different qualitative and quantitative morph agronomic characters to determine the variation among germplasm collection in Iran. As we know that each and every trait is under the control of a specific gene. So it is considered that this variation among the different genotypes is may be due to the variation in genetic makeup of the wheat accessions. The genetic constituent of the genotypes coupled with environmental and other agronomic factors might be responsible to the variation in morphometric characters. Bhattacharya & Sowbhagya (1980); Das *et al*. (1983); Vanagamudi *et al*. (1988) reported the similar observations in wheat, maize and rice. Our

findings are also supported by the outcomes of qualitative investigations of many other researchers (Thangvel *et al*., 2005; Karagoz *et al*., 2006; Haljak *et al*., 2008). Therefore, these qualitative traits are reported as key characters for the identification and characterization of wheat genotypes and cultivars by Kumar *et al*., 1993 and in the present investigation as well.

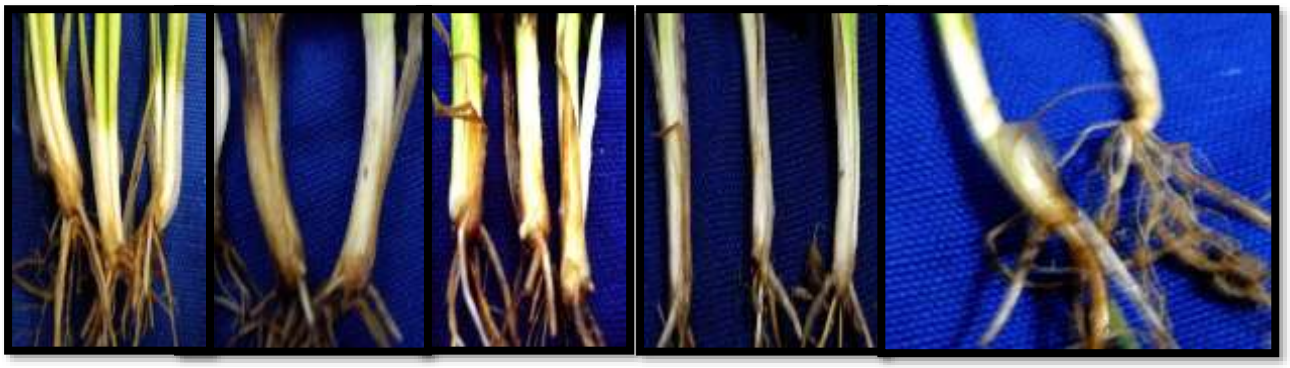

Fig.1. *Growth habit attern) A-08, intermediate (b) A-09, Semi-erect(c) A-17, erect(d) A-25 erect (e) S-14, semi-erect*

Fig.2. *Foliage color (a)A-08,dark green(b)A-09,light green(c)A-17,yellowish green(d)A-25, dark green (e)S-14, light green*

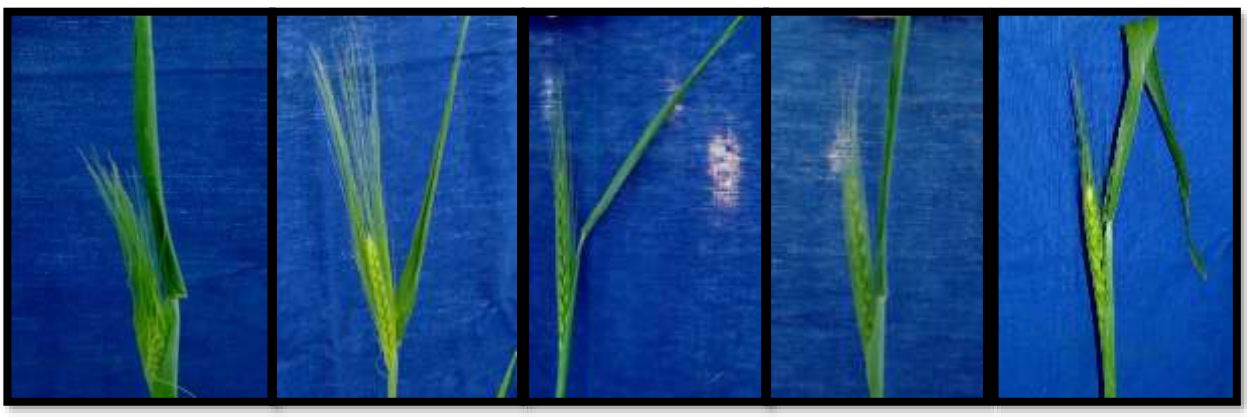

Fig.3. *Flag leaf attitude (a)A-08, erect (b)A-09, semi-erect (c)A-17, semi-drooping (d)A-25, erect (e)S-14, drooping*

Fig.4. *Spike color (a) A-08, dark brown (b) A-09, dull white (c)A-17, light brown (d)A-25, white (e)S-14, radish brown*

Fig.5. *Spike shape (a) A-08, tapering (b) A-09, parallel (c) A-17, tapering (d) A-25, parallel (e) S-14, tapering*

Fig.6. *Spikelet density (a) A-08, medium (b) A-09, dense (c) A-17, medium (d) A-25, medium (e) S-14, dense*

Fig.7. *Awn attitude (a) A-08, spreading (b) A-09, oppressed (c, d, e) A-17, A-25, S-14 all have spreading awn attitude*

Figure 8 Awn length (a) A-08, short (b) A-09, long (c) A-17, medium (d) A-25, short (e) S-14, long

4. CONCLUSION

It is concluded from present study that variations exist in phenotypic characters of different varieties of crop because all these characters/ traits are under the control of major gene complex. But expression of respective gene complex is may be influenced either by variety, ecological conditions or due to interaction of both (V x E). Therefore, identification of cultivar, variety or accessions by phenotypic variations in morphological characters is not a reliable way. There is dire need to emphasize on molecular analysis of genotypes for screening and identification.

REFERENCES

Aghaee, M., R. Mohammadi and S. Nabovati. 2010. Agro-morphological characterization of durum wheat accessions using pattern analysis. *Aust. J. Crop Sci*., 4(7): 505-514.

Arunkumar, M.B., R.J. Bherry, M. Dadlani, A. Varier and S.P. Sharma. 2004. Characterization of pearl millet hybrids and parental lines using morphological characters. *Seed Res*., 32(1): 15-19.

Bhattacharya, K.R. and C.M. Sowbhagya. 1980. Size and shape classification of rice. *Riso.*, 29(3): 181-185.

Das, G.R., T. Ahmed and B.C. Bhattacharjee. 1983. Classification of grain shape and relationship between grain, weight and grain dimensions in unhealed rice. *Indian J. Agric. Sci*., 53(8): 744-751.

Haljak , M., R. Koppel, A. Ingver and V. Ruzgas. 2008. Variations in the morphological characteristics of winter wheat (*Triticum aestivum* L.). *Agronomijas vestis. Latvian J. Agron*., 11: 54-59.

Karagoz A., N. Pilanali and T. Polat. 2006. Agro-morphological characterization of some wild heat (*Agilops* L. and *Triticum*) species. *Turk.J.Agric*., 30: 387-398.

Kumar, A., D.P. Singh and S.K. Yadav. 1993. Partitioning of dry matter accumulation in *aestivum* and *durum* wheat under irrigated and non-irrigated field conditions. *Ind. J. Plant Physiol*., 30: 126-129.

Rehman, M., L. Jennifer, J. Brown and S. Zemetra. 2006. Evaluation of the morphological characters of some wheat varieties. *Amer. J. Cere. Sci*., 98: 342-351.

Thangvel, P., A. Bharathi, N. Natarajan and T. Evera. 2005. Varietal grouping in sorghum by seed and seedling morphology and response to chemical testing. *Karnataka J. Agril. Sci.,* 18 (3): 664-672.

Vanagamudi, K., V. Palaniswami, P. Natesan and T.V. Karivartharaju. 1988. Variety determination in rice- examination of the hulled grain. *Seed Sci. Technol*., 16: 457-464.

Fig.9. a, b, c, d and e, *Brush hair length of seeds A-08, A-09, A-17, A-25 and S-14 respectively*

Fig.10. a, b, c, d and e, *Seed crease of wheat lines A-08, A-09, A-17, A-25 and S-14 respectively*

Fig.8. a, b, c, d and e, *Seed of wheat line A-08, A-09, A-17, A-25 and S-14 respectively*

Table 1a Phenotypic Characterization of Wheat (*Triticum aestivum* L.) Accessions on the Basis of Plant Morphology

Genotype	Growth Habit	Foliage Color	Flag Leaf Attitude	Spike Color	Spike Shape	Spikelet Density	Awn Color	Awn Attitude	Awn Length
A-08	Intermediate	Dark green	Erect	Dark brown	Tapering	Medium	Dark Brown	Spreading	Short
A-09	Erect	Light green	Semi-erect	Dull white	Parallel	Dense	White	Oppressed	Long
A-17	Semi-erect	green	Semi-drooping	Light brown	Tapering	Medium	Brown	Spreading	Medium
A-25	Erect	Dark green	Semi-erect	White	Parallel	Medium	White	Spreading	Short
S-14	Semi-erect	Light green	Drooping	Reddish brown	Tapering	Dens	Brown	Spreading	Long

Table 1b Phenotypic Characterization of Selected Wheat (*Triticum aestivum* L.) Accessions on the Basis of Seed Morphology

Genotype	Seed Color	Seed Shape	Seed Size	Test Weight (gm)	Seed Hardness	Seed Germ Width	Seed Crease	Brush Hair Length
A-08	Red	Ovate	Bold	37.8	Hard	Medium	Medium	Short
A-09	Red	Oblong	Very bold	42.3	Hard	Wide and Deep	Deep	Long
A-17	White	Oblong	Medium Bold	34.9	Hard	Medium	Shallow	Short
A-25	White	Oblong	Bold	39.2	Hard	Wide	Medium	Long
S-14	White	Elliptical	Low Bold	29.4	Hard	Wide	Deep	Long