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# Earliness and yielding ability of selected wheat (*Triticum aestivum* L.) lines based on field performance

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**Key words:** Earliness, Genotype, Wheat, Yield.

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## Abstract

Earliness is an important factor in wheat (*Triticum aestivum* L.) genotypes which mature early are desirable, because of their ability in escaping from drought, heat stress, disease, pests and other stress at the end of the growing season. Keeping in view this problem, an experiment was conducted at in the experimental field of Nuclear Institute of Agriculture (NIA), Tandojam during 2016-17. Eleven wheat genotypes and one check variety for two phenological and twelve yield parameters were evaluated. There were three replications in randomized complete block design. The analysis of variance among the genotypes showed highly significant differences ($P \leq 0.01$) for all the traits studied. Check variety 'Kiran-95' produced plants with shorter height and took less days to 75% heading. Among coded wheat lines MYT-6, MYT-8 and MYT-5 performed well for the traits grain weight spike$^{-1}$, 1000-grain weight and harvest index respectively. Hence these genotypes may be used for further breeding program.

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## Introduction

Bread wheat (*Triticum aestivum* L.) is one of the leading cultivated crops across the word along with most widely consumed cereal by humans (Spika 2019) is a hexaploid specie belongs to the family *Poaceae* (Moon, 2008). Being the second most important food after rice. Supplies 20% of total calories and a similar portion of total protein to the world's population (Dowla *et al.*, 2018). Human existence heavily depends upon the daily consumption of food by each individual. So, more than 35% population consumes wheat to meet their dietary needs (Memon *et al.*, 2019). One can compromise on clothing and shelter, however, health and hygiene, sufficient food with ample nutrition stays at priority so wheat helps to achieve this goal globally to tackle food security challenge by fulfilling the dietary needs of many (Jaiswal *et al.* 2019).

Wheat yield can be increased1through the development of productive cultivars which better adapt1various agro-climatic1conditions, resist1all types of biotic and abiotic1stresses and yield more. Sufficient genetic1variability in the genetic stock facilities selection for improved traits (Ali *et al.*, 2013). Earliness is an important factor in wheat, genotypes which mature early are desirable, because of their ability in escaping from drought, heat stress, disease, pests and other stress at the end of the growing season (Menshawy, 2007). So development of wheat cultivars with early maturing and without decrease in grain yield is a main objective of many wheat breeding programs. (Hassan *et al.*, 2014). Current and expected future relative rated of progress in yield potential adoption in wheat are a matter of real concern, and insufficient to meet the projected demand of cereals by 2050 (Araus *et al.*, 2019).

Keeping in view this scenario present study was conducted with a objective to identify best performing genotype for various phonological and yield attributing traits.

## Materials and methods

Present experiment t was conducted at experimental field of Nuclear Institute of Agriculture (NIA), Tandojam during Rabi Season in year 2016-17. Experiment was conducted in Randomized Complete Block Design (RCBD) with three replications. Eleven coded lines (MYT-1, MYT-2, MYT-3, MYT-4, MYT-5, MYT-6, MYT-7, MYT-8, MYT-9, MYT-10, MYT-11) along with one commercial check variety (Kiran-95) were evaluated under field condition for two (02) earliness and twelve (12) yield associated traits.

### *Statistical analysis*

The analysis of variance was conducted through Statistix 8.1 for fourteen different traits recorded from 12 bread wheat genotypes.

## Results

### *Analysis of variance*

The pooled ANOVA for all the traits is summarized in Tables 1a and 1b.

**Table 1a.** Analysis of variance of earliness and yield associated traits of wheat genotypes evaluated in micro-yield trial during 2016-17.

| | Mean squares | | |
|---|---|---|---|
| Traits | Replications (R) D.F.= 2 | Genotypes (G) D.F.= 11 | Error D.F.= 22 |
| Days to 75% heading | 20.25 | 280.4** | 11.76 |
| Days to 75% maturity | 2.25 | 38.25** | 3.52 |
| Plant height | 65.5 | 273.1** | 34.11 |
| Peduncle length | 9.80 | 54.25** | 15.16 |
| Tillers plant-1 | 6.03 | 1.32n/s | 0.75 |
| Spike length | 0.44 | 0.83* | 0.33 |
| Spikeletes spike-1 | 2.21 | 7.94** | 1.79 |

n/s = Non-significant

* = Significant = P < 0.05 level of probalitity.

** = Significant = P < 0.01 level of probalitity.

Results suggested the significant variation among genotypes for most of the traits studied under present studies. Mean squares of genotypes from ANOVA showed highly significant difference (P≤0.01 level of probability) for most of the characters under study indicating the existence of genetic variability among the genotypes.

The traits viz., days to 75% heading, days to 75% maturity, plant height, peduncle length, spikeletes spike$^{-1}$, grain yield plot$^{-1}$,1000-grain weight except biological yield plot$^{-1}$, spike length, grains spike, grain weight spike$^{-1}$ and harvest index showed significant differences, however, tillers plant$^{-1}$, and flag leaf area showed non-significant differences. The mean of squares suggested that the genotypes selected were genetically variable and considerable amount of variability existed among them, thus indicates the selection for different quantitative characters for wheat improvement.

**Table 1b.** Analysis of variance of different yield and its associated traits of wheat genotypes evaluated in micro-yield trial during 2016-17.

| | Mean squares | | |
|---|---|---|---|
| Traits | Replications (R) D.F.= 2 | Genotypes (G) D.F.= 11 | Error D.F.= 22 |
| Grains spike$^{-1}$ | 43.78 | 118.16* | 47.31 |
| Grain weight spike$^{-1}$ | 0.0017 | 0.331* | 0.15 |
| Grain yield plot$^{-1}$ | 0.005 | 0.994** | 0.106 |
| 1000-grain weight | 16.59 | 89.28** | 5.70 |
| Biological yield plot$^{-1}$ | 1.19 | 1.060** | 0.262 |
| Harvest Index % | 66.09 | 82.70* | 36.91 |
| Flag leaf area | 2.06 | 13.78$^{n/s}$ | 14.11 |

n/s = Non-significant

*= Significant = P < 0.05 level of probalitity.

** = Significant = P < 0.01 level of probalitity.

*Mean performance of yield attributing traits*

*Days to 75% heading*

The minimum days to 75 % heading were taken by the genotype MYT-8 (66.33) and hence it stood as the early maturing variety. Kiran-95(check variety) also took less number of days to 75% heading (66.33) (Fig.1).

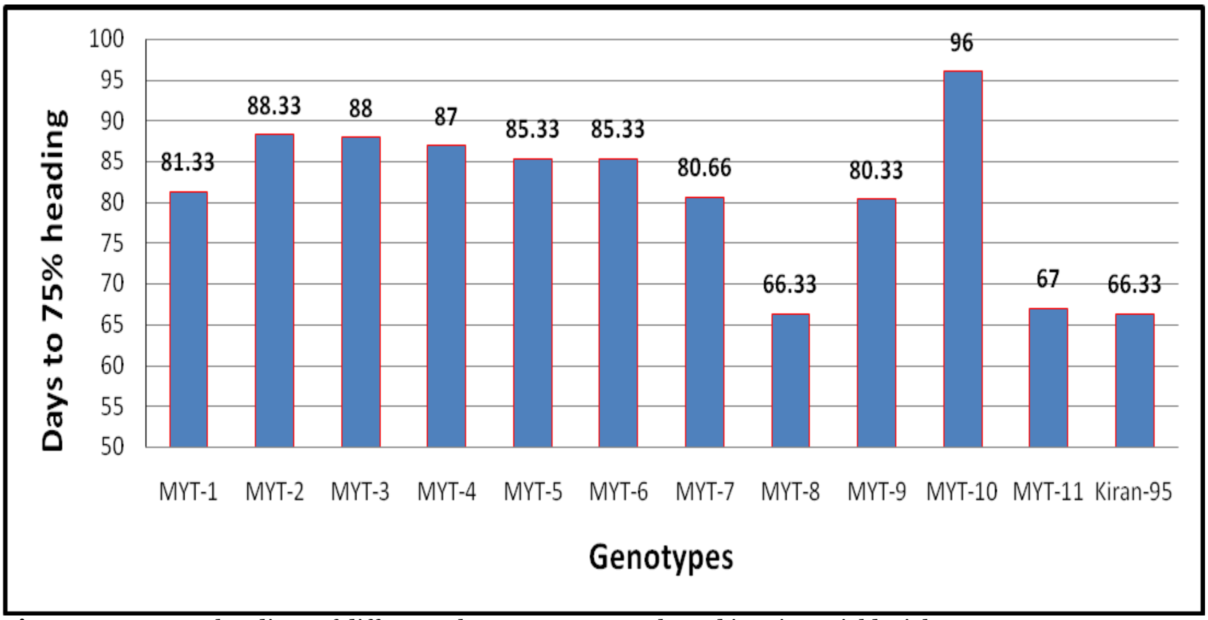


**Fig. 1.** Days to 75% headings of different wheat genotypes evaluated in micro-yield trial.

*Days to 75% maturity*

The minimum day to 75 % maturity were taken by the genotype MYT-10 (122.3), however, the check variety Kiran-95 ware next in terms of maturity as it also took less days (128.6 days) to 75% maturity (Fig. 2).

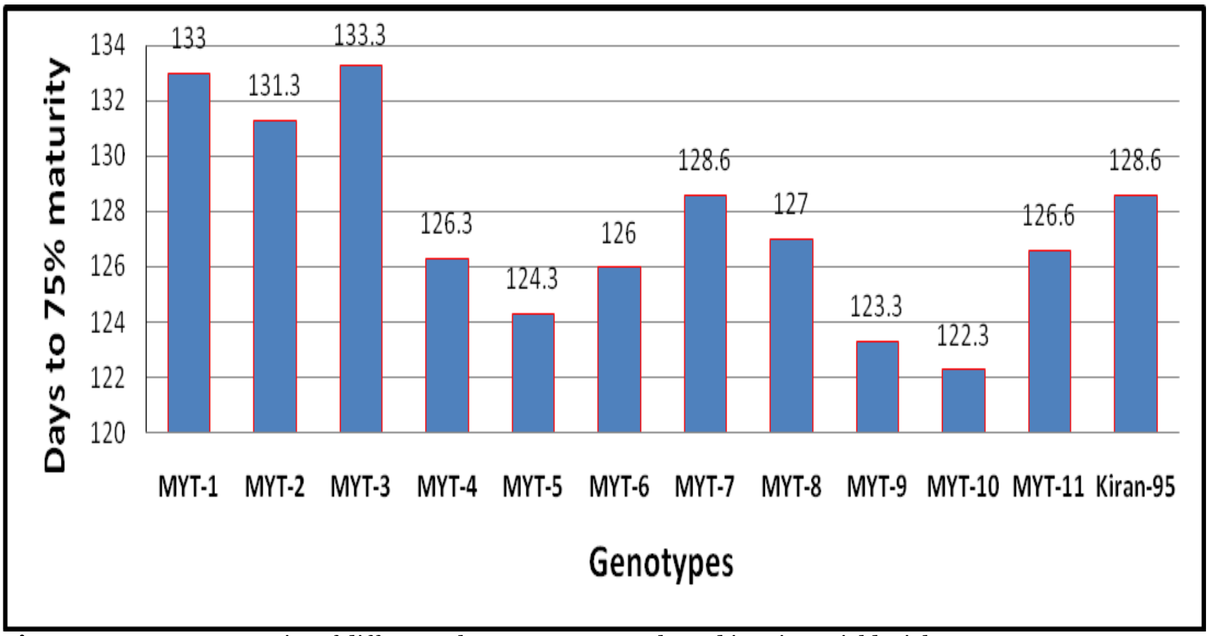


**Fig. 2.** Days to 75% maturity of different wheat genotypes evaluated in micro-yield trial.

*Plant height (cm)*

The taller plant height were recorded in the genotype MYT-5 (94.35) followed by MYT-7 (93.75 cm) whereas; short statured plants were recorded in the plant Kiran-95 (58.39) (Fig. 3).

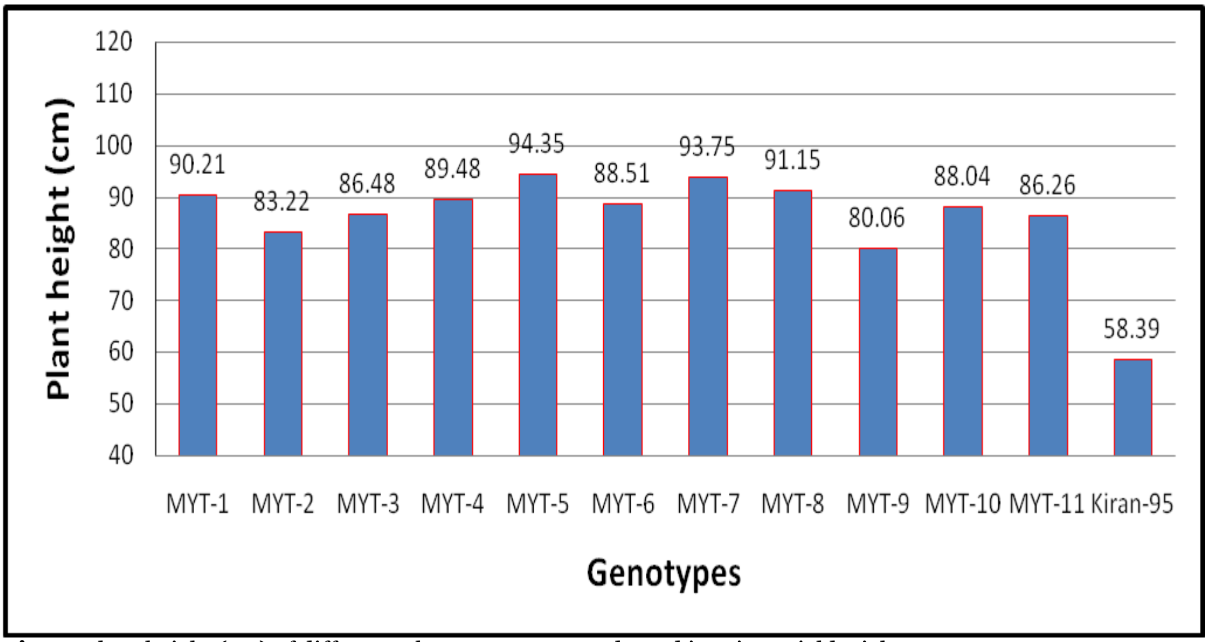


**Fig. 3.** Plant height (cm) of different wheat genotypes evaluated in micro-yield trial.

*Peduncle length (cm)*

The maximum peduncle length were recorded for the genotype MYT-1 (44.08) followed by MYT-11 (43.92) and the minimum peduncle length were recorded in the genotype check variety Kiran-95 (31.75) (Fig. 4).

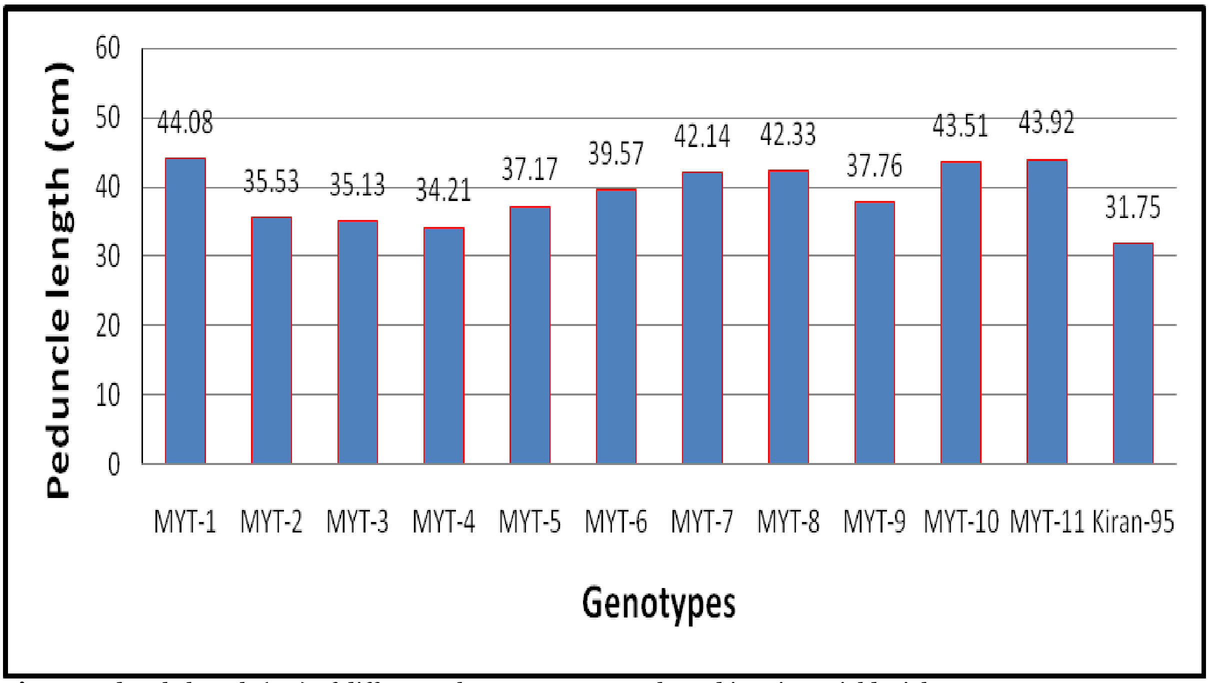


**Fig. 4.** Peduncle length (cm) of different wheat genotypes evaluated in micro-yield trial.

*Tillers plant-1:*

The maximum tillers plant-1 were recorded in the genotype MYT-10 (12.60) followed by MYT-3 (12.30) and the minimum tillers plant-1 were recorded in the genotype check variety Kiran-95 (10.10) (Fig. 5).

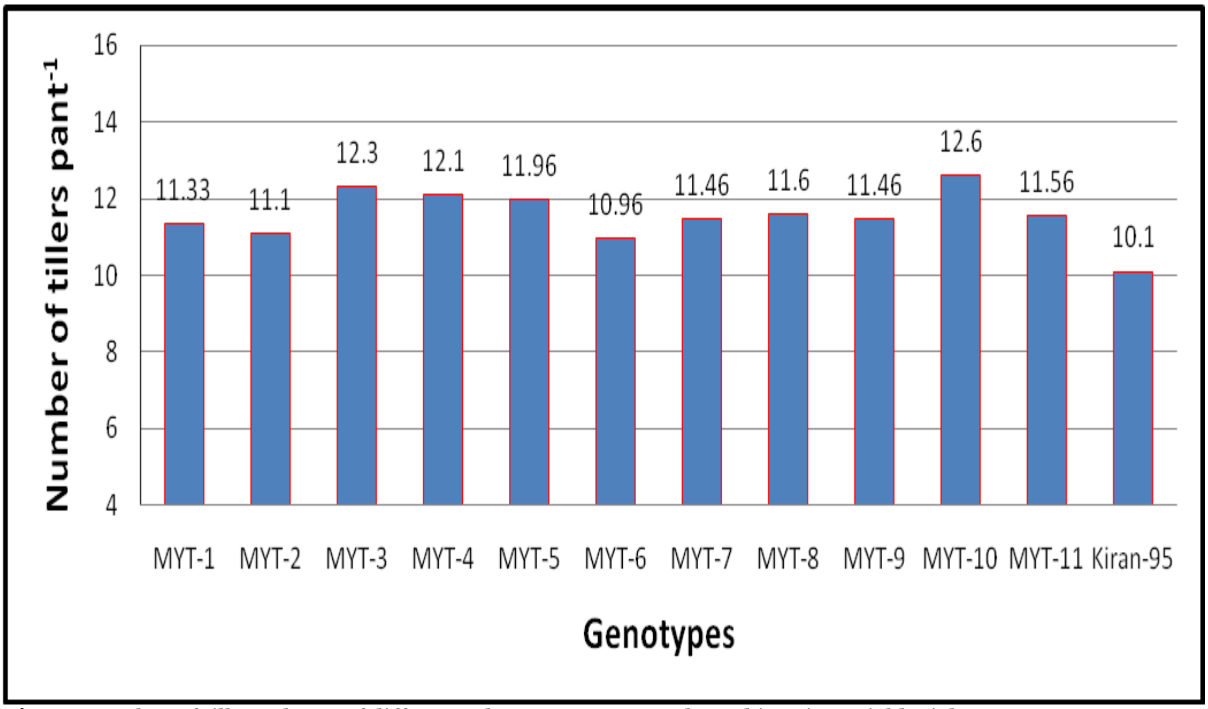


**Fig. 5.** Number of tillers plant-1 of different wheat genotypes evaluated in micro-yield trial.

*Spike length (cm)*

The maximum spike length were recorded in the genotype MYT-9 (10.25) followed by MYT-4 (9.94) and the minimum spike length were recorded in the genotype MYT-3 (8.61).However, the minimum spike length of 9.57 cm were recorded for check variety Kiran-95 (Fig. 6).

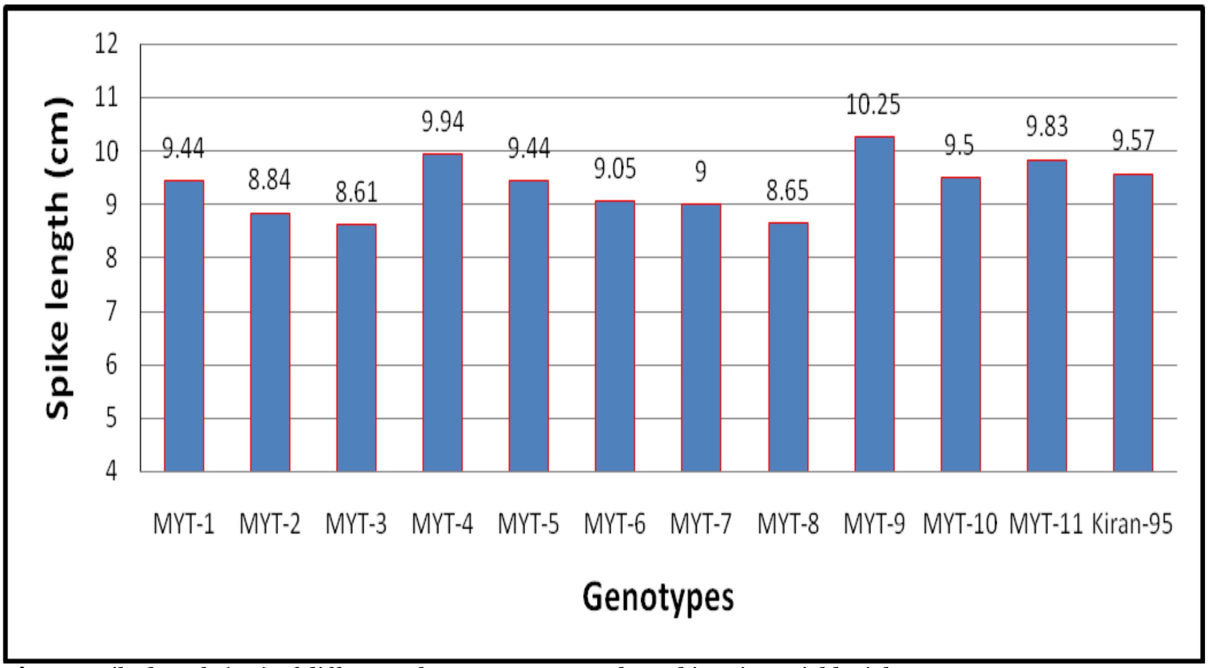


**Fig. 6.** Spike length (cm) of different wheat genotypes evaluated in micro-yield trial.

*Spikelets spike$^{-1}$*

The maximum number of spikelets spike$^{-1}$ were recorded inthe genotype MYT-4 (21.79) followed by MYT-5(21.15) whereas, theminimum number of spikelets spike$^{-1}$ were recorded in the genotype MYT-9 (16.55)as compared to the check variety Kiran-95 in which spikelets spike$^{1}$ were 17.44 (Fig. 7).

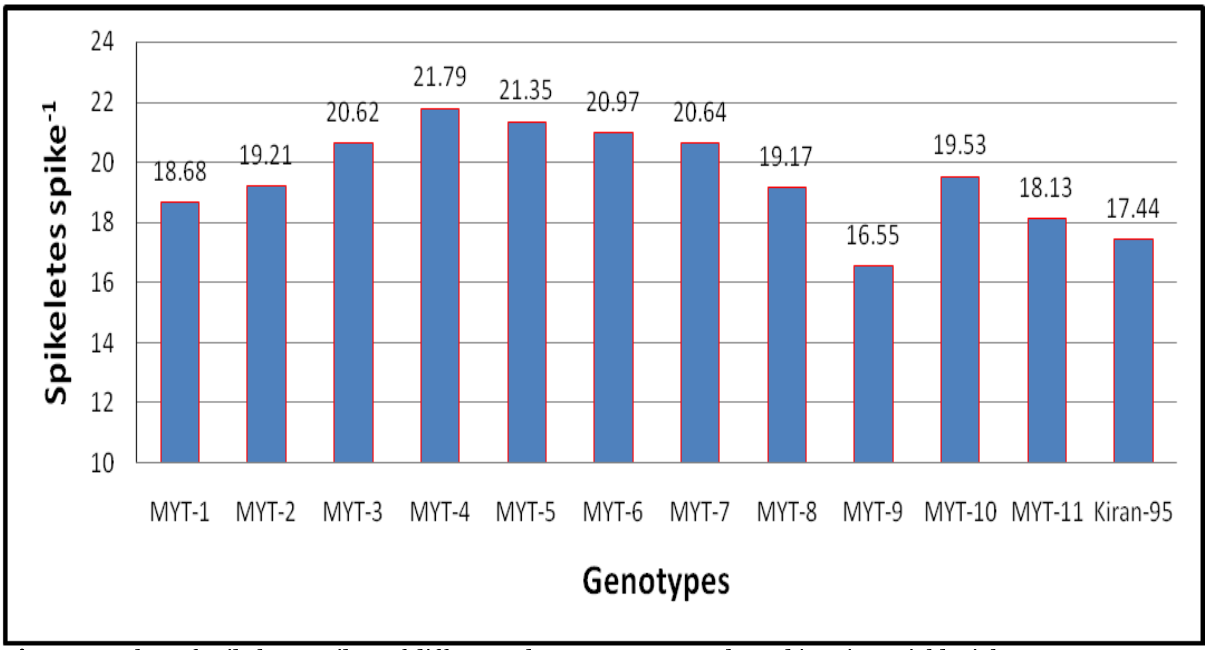


**Fig. 7.** Number of spikeletes spike$^{-1}$ of different wheat genotypes evaluated in micro-yield trial.

*Grains spike$^{-1}$*

The maximum number of grains spike$^{-1}$ were recorded in the genotype MYT-10 (72.26), followed by MYT-6 (70.11) and the minimum number of grains spike$^{-1}$ were recorded in the genotype Kiran-95 (52.57).

The coefficient of variation were 10.89, this shows that for the trait Grains spike$^{-1}$, 10.89 % variation was among genotypes (Fig.8).

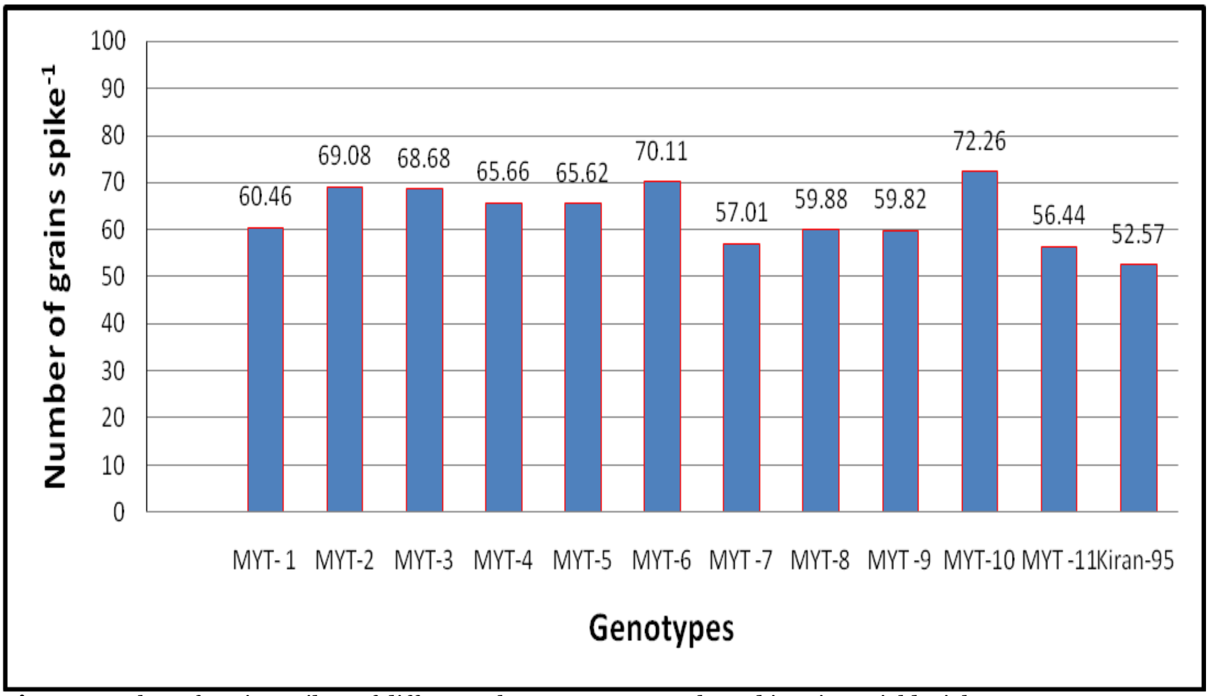


**Fig. 8.** Number of Grains spike$^{-1}$ of different wheat genotypes evaluated in micro-yield trial.

*Grain weight spike$^{-1}$ (g)*

The maximum grain weight spike$^{-1}$ were recorded in the genotype MYT-6 (3.59) followed by MYT-10 (3.27), whereas, minimum grain weight spike$^{-1}$ were recorded in the genotype Kiran-95 (2.27) (Fig. 9).

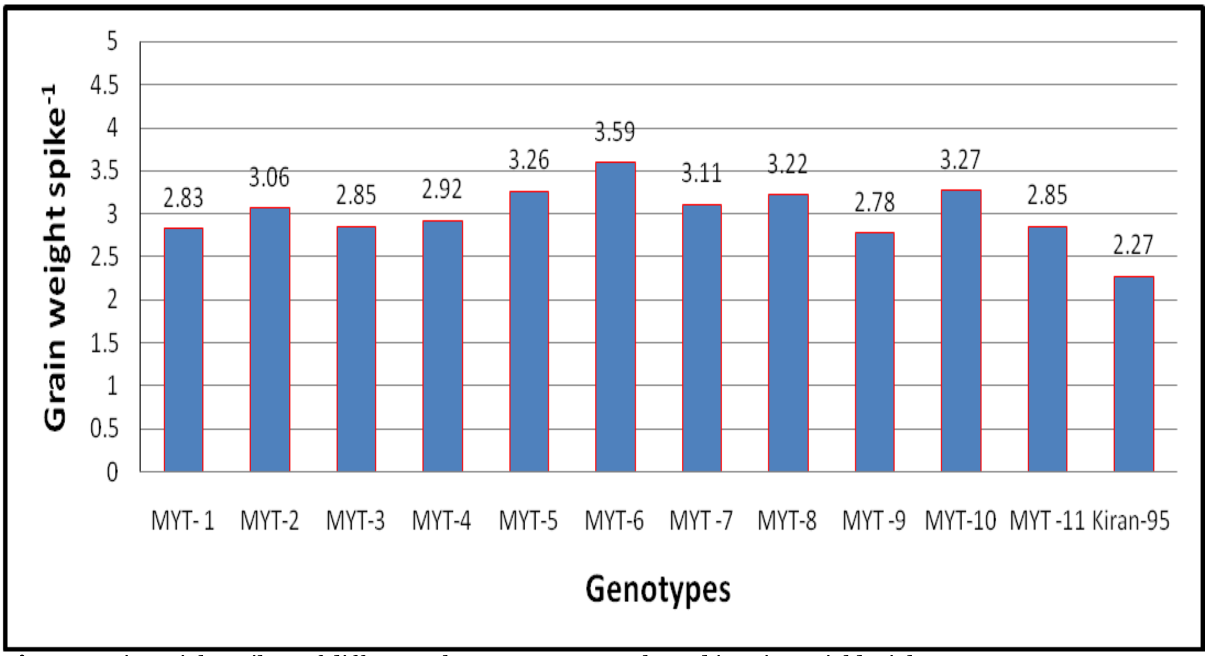


**Fig. 9.** Grain weight spike$^{-1}$ of different wheat genotypes evaluated in micro-yield trial.

*Grain yield plot $^{-1}$(kg)*

The maximum grain yield plot $^{-1}$ were recorded in the genotype MYT-7 (3.95) followed by MYT-6 (3.91) and the minimum grain yield plot $^{-1}$ were recorded in the genotype Kiran-95 (3.05) (Fig. 10).

*1000-grain weight (g)*

The maximum 1000-grain weight were recorded in the genotype MYT-8 (56.85) followed by MYT-7 (53.30) and the minimum 1000-grain weight were recorded in the genotype MYT-1 (38.76)(Fig. 11).

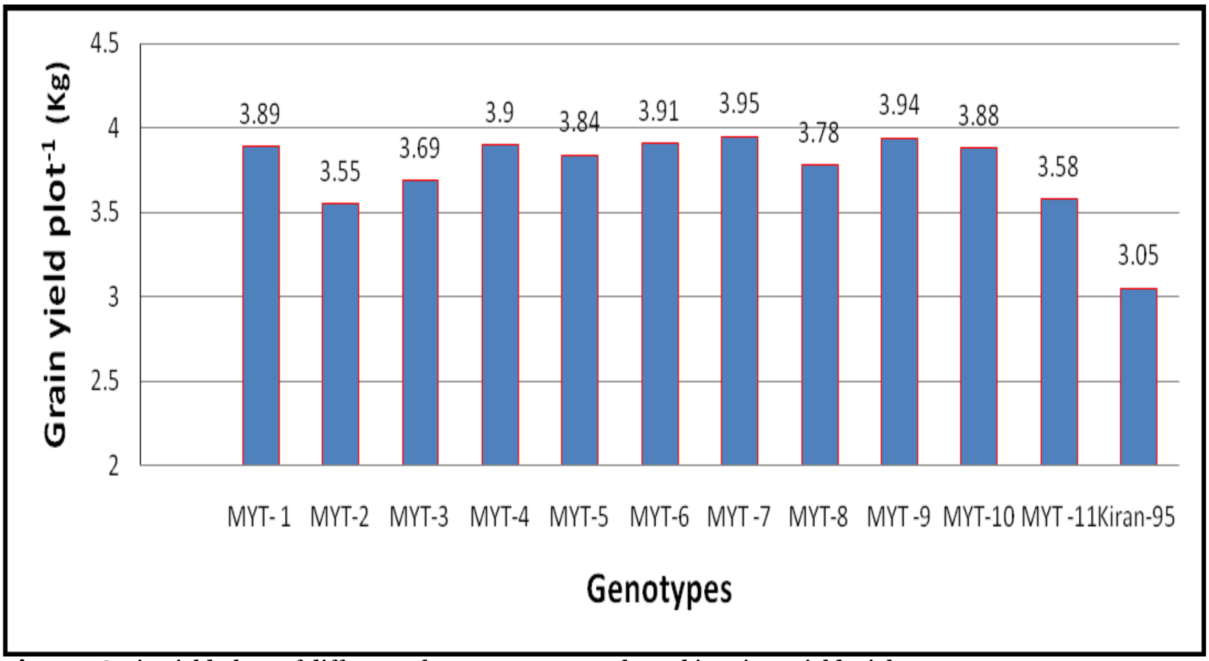


**Fig. 10.** Grain yield plot$^{-1}$ of different wheat genotypes evaluated in micro-yield trial.

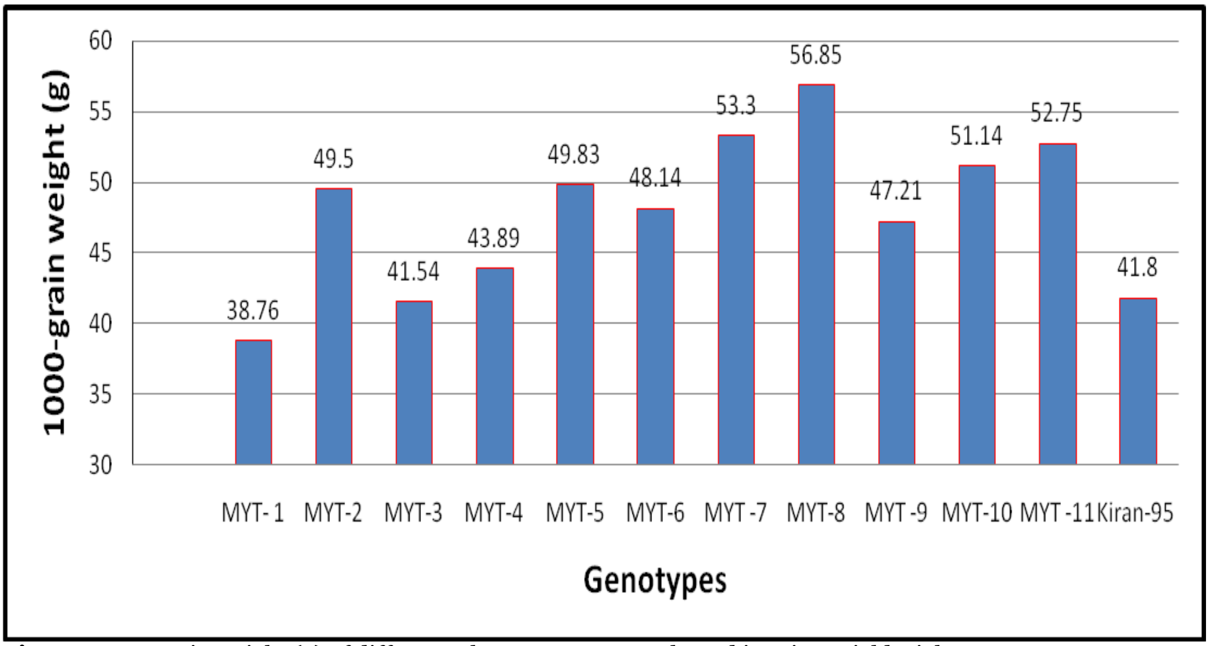


**Fig. 11.** 1000-grain weight (g) of different wheat genotypes evaluated in micro-yield trial.

*Biological yield plot$^{-1}$(kg)*

The maximum biological yield plot$^{-1}$ were recorded in the genotype MYT-5 (7.92) followed by MYT-7 (7.62), whereas, the minimum biological yield plot$^{-1}$ were recorded in the genotype MYT-11(6.93) as compared to other advanced lines as well as check variety Kiran-95 (6.12kg) (Fig. 12).

*Harvest index (%)*

The maximum harvest index were recorded in the genotype MYT-9 (55.33%) followed by MYT-1 (53.58%) and the minimum harvest index were recorded in the genotype MYT-7 (42.79) as compared to check variety Kiran-95 (49.98) (Fig. 13

*Leaf area (cm$^2$)*

The maximum leaf area were recorded in the genotype MYT-10 (36.83) followed by MYT-9 (34.89) and the minimum leaf area were recorded in the genotype Kiran-95 (29.19) (Fig. 14).

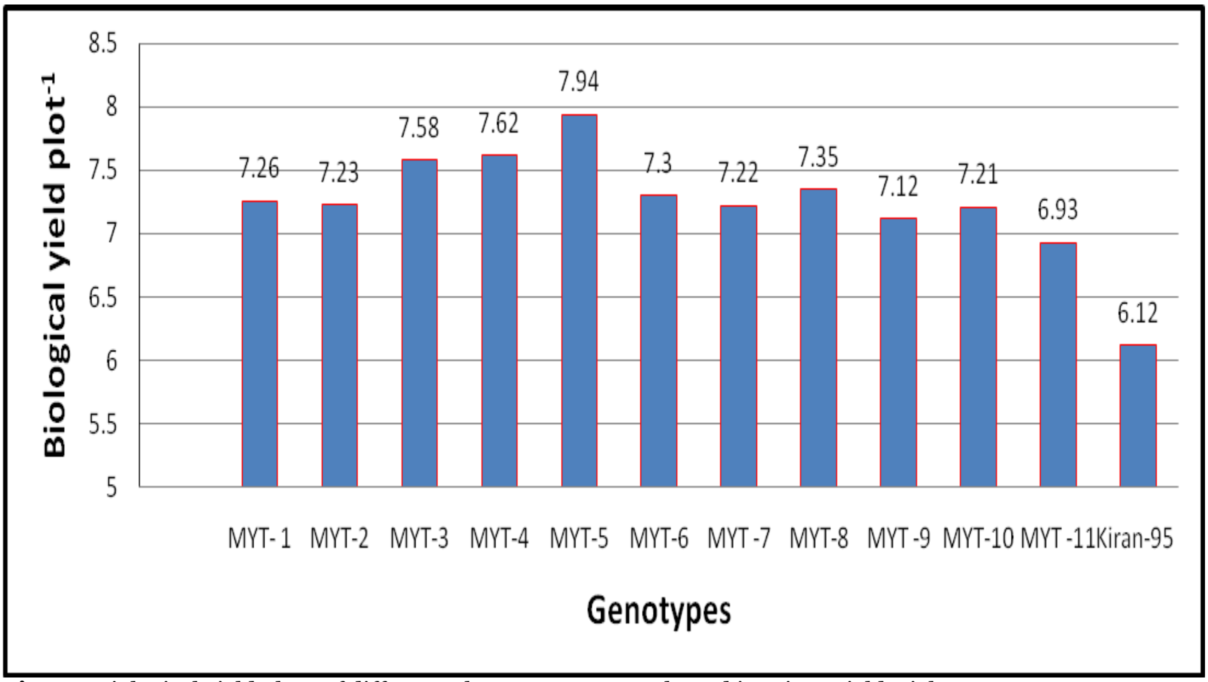


**Fig. 12.** Biological yield plot$^{-1}$ of different wheat genotypes evaluated in micro-yield trial.

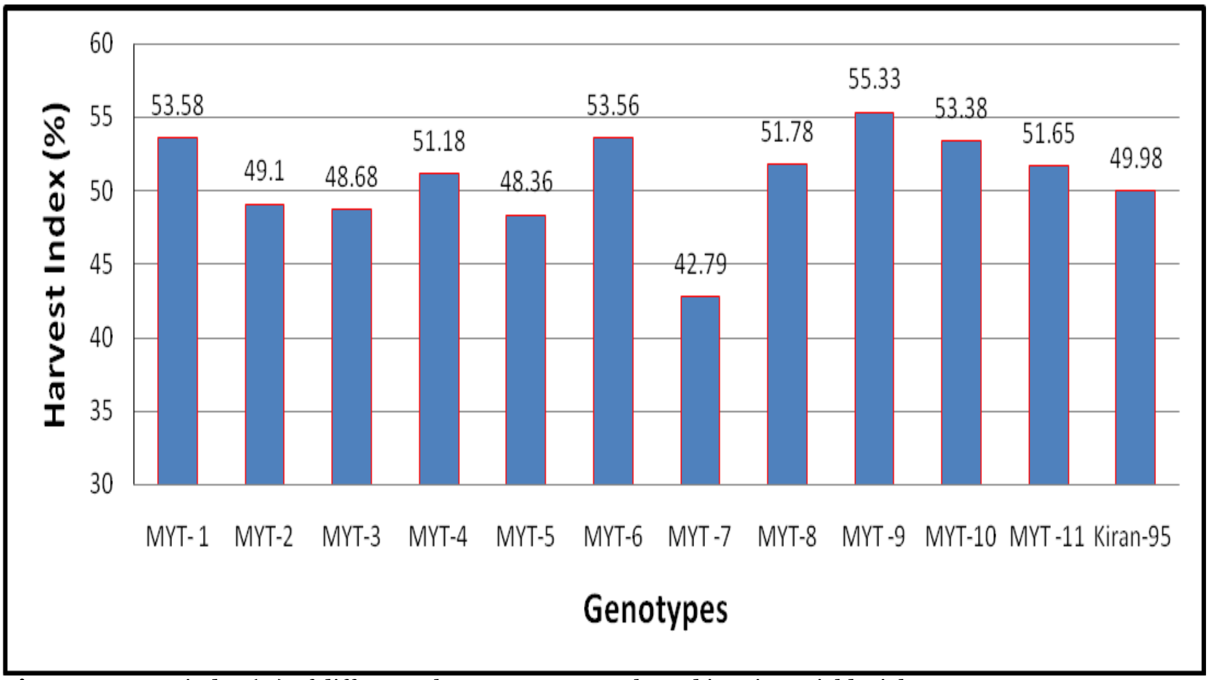


**Fig. 13.** Harvest index (%) of different wheat genotypes evaluated in micro-yield trial.

**Discussion**

Evaluation of genotypes under field condition describe their performance in terms of yield that they give, moreover, this test facilitates selection as the best performer is identified. This is done on the basis of exploiting genotypic variation among the plant material tested.

Or studies of this nature are found to be as routine work under different breeding programs practiced inland and abroad for the improvement of crop plants so that the benefits could be reaped at larger scale.

The researchers like Safeer-ul-Hassan *et al.* (2005) also under took one of the studies like this and recorded data on morphological traits of the genotypes studied so that the mean performances as per each trait may be saved.

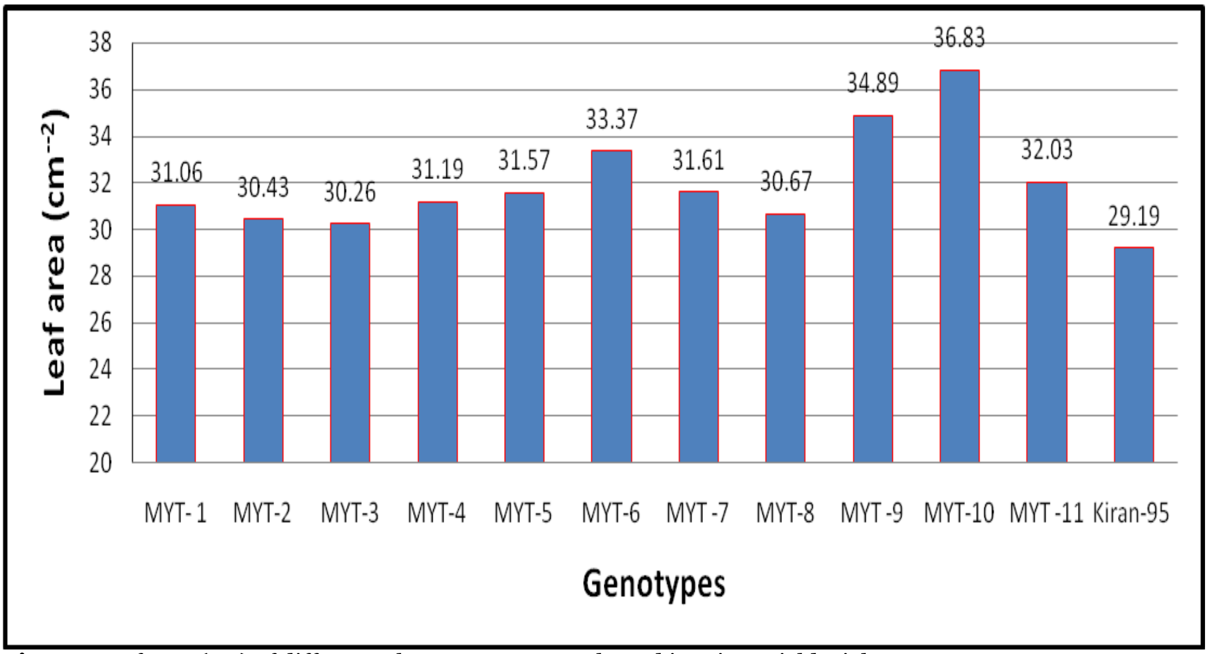


**Fig. 14.** Leaf area (cm) of different wheat genotypes evaluated in micro-yield trial.

Moreover, they found that the genotypes differed significantly for spikelets number spike$^{-1}$, plant height, grains plant$^{-1}$, weight of grains spike$^{-1}$, 1000-grains weight (seed index value) and spike length grain yield. Similar research project was initiated by Rehman *et al.* (2015), they concluded that greater number of tillers and grain yield are major yield contributing factors in selecting high yielding wheat cultivars. Likewise, findings of Safeer-ul-Hassan *et al.* (2005), depicted highly significant variation among wheat genotypes for all studied attributes in both control and drought stress conditions.

Our findings are confirmed with Ajmal *et al.* (2009) they observed that genotypes showed significant variation for height of plant, tillers number in a plant, spikelet number per spike, grains number per spike and grain yield. Jatoi *et al.* (2011) they reported that analysis of variance revealed significant differences between treatments and among the cultivars. Minimum days to 75 % heading were taken by the genotype MYT-8 (66.33) and hence it stood as the early maturing variety. Kiran-95(check variety) also took less number of days to 75% heading. Shahryari *et al.* (2013) worked on the relationship among yield and its related characters in bread wheat significant differences among cultivars for days to heading were found. The minimum day to 75 % maturity were taken by the genotype MYT-10 (122.3), however, the check variety Kiran-95 ware next in terms of maturity as it also took less days (128.6 days) to 75% maturity.

Our results are in agreement with those of Ngwako and Mashiqa (2013) they reported a remarkable variation in the genotypes for days taken to maturity and grain yield. Kumar (2017) observed a significant variation for plant height and grains spike$^{-1}$ in various wheat genotypes. TD-1 produced maximum spike length (12.8 cm) and achieved more 1000- grain weight (44.9g). Salehi *et al.* (2016) investigated the effects of morphological characters on qualitative and quantitative yield of bread wheat genotypes peduncle length and spikeletes spike$^{-1}$. Asif *et al.* (2012) observed variation in genotypes for the trait crop leaf area, leaf area duration and tillers plant$^{-1}$. Khakwani *et al.* (2012) reported that the genotype Hashim-8 indicated higher relative water content, total grain yield plant$^{-1}$, biological yield plant$^{-1}$ and harvest index.

**Conclusion**

It is concluded from the present study that check variety Kiran-95 produced plants with shorter height and took less days to 75% heading. Among coded wheat lines MYT-6, MYT-8 and MYT-5 performed well for the traits grain weight spike$^{-1}$, 1000-grain weight and harvest index respectively.

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