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Assessment of genetic variability for yield and yield contributing characters in durum wheat (*Triticum durum* Desf.) under limited irrigation condition

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Abstract
Study involves forty three genotypes of wheat evaluated at Agriculture Research Station, Niphad during *Rabi* 2018-19 in a Randomized Block Design with two replications. The data revealed that, sufficient variability was present among the genotypes under study. Phenotypic coefficient of variation estimates was slightly higher than genotypic coefficient of variation. High estimates of heritability (b.s.) was observed for all the characters studied except flag leaf breadth. High heritability accompanied with high genetic advance as percent mean was observed in case of grain yield per meter, length of peduncle, 1000 grain weight and productive tillers per meter where as high heritability coupled with moderate genetic advance as per cent of mean was observed for flag leaf length followed by days to 50% heading, number of grains per spike and number of flower per spike indicating an additive gene action in the inheritance of these traits and scope for direct selection of these characters in early generations.

Keywords: Genotypes, PCV, GCV, heritability, genetic advance as % of mean

1. Introduction
Durum is an important species of wheat which requires less water as its adoption to semi-arid environment. Wheat is cool season crop, which requires average temperature 18^0C-22^0C. Wheat grows well in areas having annual rainfall of 750-1600 mm. Water requirement of wheat crop is about 40 cm, however the durum wheat can be grown as rainfed crop. It is a self-pollinated crop with extent of about 0 to 6 per cent cross pollination. The self-pollination is mainly due to chasmogamous flowers. Wheat is mainly grown under rainfed conditions and yield is often constrained by water and heat stresses that are common during the grain-filling period, which is due to the low and unpredictable seasonal rainfalls and high temperatures during the last stages of its development cycle. Terminal drought and heat stresses negatively affect wheat grain weight and yield. More variation within species is useful for selection of parents. In the present investigation diverse genotypes of durum wheat were evaluated. On the basis of this study, superior genotypes can be investigated and can be proposed for their use in hybridization programme.

2. Material and Methods
The present investigation was conducted at Agricultural Research Station, Niphad during Rabi 2018-2019 to study the variability among forty one genotypes with two checks of Durum wheat. Experiment was conducted using Randomized block design (RBD) with two replications in two rows of 6.00 meter length having spacing of 20 cm between the rows. Planting was done by hand drilling in November 5, 2018. Recommended fertilizer rate of 60:30:00 kg/ha (N:P:K). Observations were recorded for 14 characters *viz*.; days to 50% heading, coleoptile length, days to maturity, plant height (cm), tiller per meter, peduncle length, flag leaf length (cm), flag leaf breadth (mm), spike length, number of spikelets, number of flower per spike, grains per spike,1000 grains weight (g), and grain yield per running meter (q/ha). Statistical analysis was performed by methods proposed by Panse and Sukhatme (1985) [11]. The variability parameters were estimated as suggested by Burton (1952) [7], Johnson *et al.* (1955) [9] and Allard (1960) [1].

3. Result and Discussion
Variability parameters such as range, mean, genotypic variance, phenotypic variance, genotypic coefficient of variation, phenotypic coefficient of variation, heritability, genetic advance and genetic advance as % of mean are presented in Table 1.

The analysis of variance revealed significant genotypic differences among the material studied for all the characters indicating the presence of high genetic variability. The overall mean and range for yield and it's components revealed that there was substantial genetic variability for all characters. The analysis of variance revealed significant differences among the genotypes for all the fourteen characters studied. This information suggests that considerable amount of variation persists for all the characters and considerable improvement can be achieved by selection for these characters. Getachew (1993) [8], Monpara (2009) [10], Abinasa *et al.* (2011) [2], Ahmadizadeh *et al.* (2011) [3] and Ali and Shakor (2012) [5] also reported significant differences for yield contributing characters.

The estimates of GCV were lower than PCV for all the characters under study. The magnitude, phenotypic coefficients of variation were greater than genotypic coefficients of variation. Similar results were also reported by Monpara (2009) [10], Bogale *et al.* (2011) [6], Tsegaye *et al.* (2012) [13], Alam *et al.* (2013) [4] and Rathwa *et al.* (2018) [12]. Highest PCV was exhibited by grain yield per running meter followed by tiller per meter, length of peduncle. Moderate PCV was exhibited by peduncle length, 1000 grain weight, flag leaf length, flag leaf breadth, number of grains per spike and spike length, days to 50% heading, coleoptile length, flower per spike. Comparatively lower PCV was observed for number of spikelet per spike, plant height, days to maturity. Highest values for GCV was observed for grain yield per meter followed by tiller per meter, length of peduncle, 1000 grain weight, flag leaf length. Comparatively, lower GCV was observed for days to 50% heading, number of grain per spike, number of flower per spike, coleoptile length, spike length, plant height, number of spikelet per spike, flag leaf breadth and days to maturity. High heritability with high genetic advance as a per cent of mean was observed for tillers per meter, peduncle length, 1000 grain weight, tiller per meter and grain yield per meter while high heritability with moderate genetic advance as a per cent of mean was observed for days to 50% heading, flag flowers per spike and grains per spike. Getachew (1993) [8], Monpara (2009) [10] and Abinasa *et al.* (2011) [2] also reported similar results for tiller number, grain yield per plant, number of kernels spike^{-1}, harvest index and 1000 kernel weight. Whereas, high heritability with low genetic advance as a per cent of mean was observed for days to maturity, coleoptile length, plant height, flag leaf breadth, spikelets per spike, and spike length.

Table 1: Estimates of variability parameters for different characters of wheat

Sr. No.	Characters	Mean	Range	σ^2 g	σ^2p	GCV %	PCV %	h2 % (bs)	GA	GA as % mean
1	Days to 50% heading	69.58	55.50-82.00	35.824	37.317	8.602	8.779	96.00	12.081	17.362
2	Days to maturity	112.30	99.50-115.50	22.819	24.874	4.254	4.441	91.70	9.425	8.393
3	Coleoptile length(mm)	36.33	31.65-42.90	5.127	9.756	6.231	8.551	53.10	3.399	9.353
4	Plant height (cm)	71.95	56.15-81.80	16.467	25.810	5.639	7.060	63.80	6.677	9.279
5	Tiller per meter	21.77	14.40-30.60	18.385	20.442	19.689	20.761	89.90	8.377	38.464
6	Peduncle length (cm)	15.36	10.90-22.95	4.479	6.238	13.775	16.258	71.80	3.694	24.045
7	Flag leaf length (cm)	19.85	14.40-24.00	4.051	4.957	10.138	11.215	81.70	3.748	18.881
8	Flag leaf breadth (cm)	1.46	1.20-1.75	0.006	0.019	5.183	9.491	29.80	0.085	5.830
9	Spike length (cm)	6.11	5.55-7.35	0.142	0.251	6.170	8.825	48.90	0.543	8.887
10	Spikelet per spike	15.24	13.60-17.65	0.690	1.221	5.450	7.250	56.50	1.286	8.440
11	Flower per spike	42.46	36.50-51.70	9.631	12.829	7.307	8.434	75.10	5.539	13.042
12	Grain per spike	40.07	33.50-49.00	10.450	12.629	8.066	8.868	82.70	6.058	15.116
13	1000 Grain weight	48.50	33.15-59.60	37.869	40.635	12.687	13.142	93.20	12.238	25.230
14	Grain yield /meter	42.25	25.35-65.55	77.307	89.036	20.811	22.333	86.80	16.877	39.946

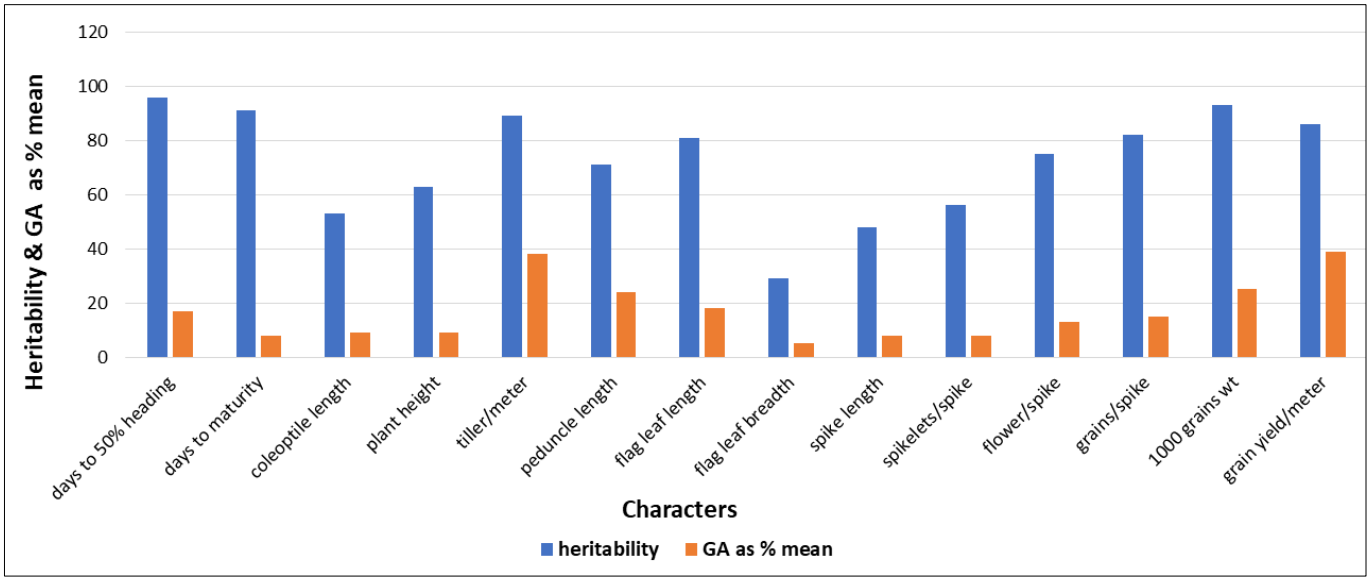

Fig 1: Graphical comparison of heritability and genetic advance as percent of mean for fourteen characters studied in Durum wheat

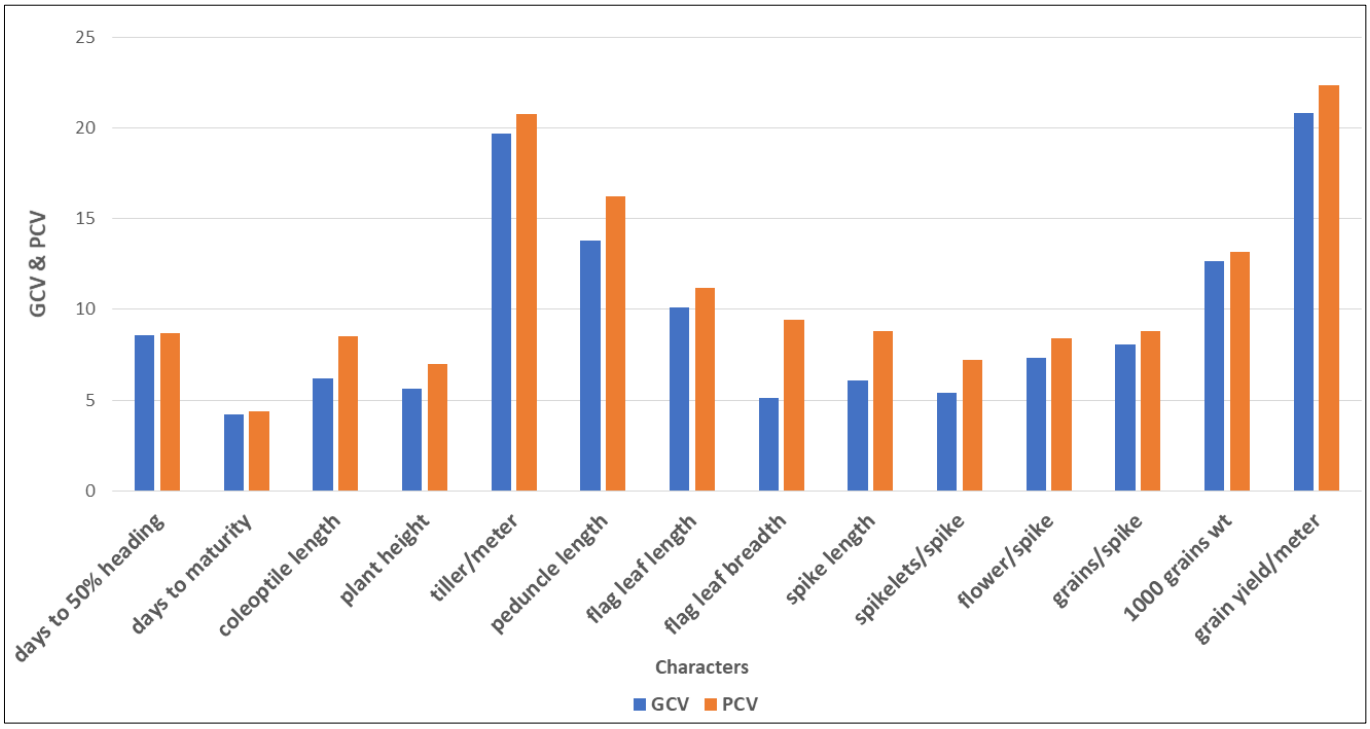

Fig 2: Graphical comparison of GCV & PCV for fourteen characters studied in Durum wheat

4. Conclusion

Keeping in view all the above aspects, the genotypes AKDW 2997-16, NIDW 15, NIDW 1470, NIDW 1479, NIDW 1490, NIDW 1458, NIDW 1462 in the present studies, deserve to be considered as potent parents for future crossing programme for improvement of grain yield and yield contributing characters under limited irrigation condition, especially a genotype AKDW 2997-16 (Sharad) and NIDW 15 (Panchavati) may prove fruitful in producing desirable segregants.

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