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Phenotypic response of cotton genotypes for yield and fiber quality traits

Abdul Wahab Soomro
Central Cotton Research Institute Sakrand (Pakistan Central Cotton Committee)

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ABSTRACT

Twenty five cotton genotypes were tested with two standard check varieties in National Coordinated Varietal Trial (NCVT). The significant difference was observed among all the genotypes of yield, its contributing traits and fiber quality traits, which indicated sufficient genetic diversity, were present in the material. Among the genotypes, ICI-2121, GH-Hadi and NIAB-898 are high yielding cotton genotypes; these are suggested for commercial cultivation at the environmental condition of central zone of Sindh to boost up cotton production and at the same time utilization in hybridization and breeding program to evolve high yielding variety. For the fiber quality traits NIBA-898 and NS-191 are suitable genotypes to meet the criteria of textile sector.

Key word: Cotton genotypes, phenotypic performance, seed cotton yield and fiber traits.

INTRODUCTION: Cotton is an important cash and fiber crop of Pakistan, whereas the yield of this crop is reliant upon the environment in which it is grown and management practices of the cropping system. Cotton contribute raw material to textile sector, that's why countries economy depend on this crop. It provides seeds with potential of various products viz. lint, oil, hulls and food for animals (Ozyigit 2008). Globally Pakistan is 5th largest cotton producing country, 3rd major consumer as compared with other cotton growing countries. The area under cotton cultivation in Pakistan during year 2019-20 was 2.895 million hectares and production was 12.72 million bales, as regards the provincial status, Punjab contributed 2.145 million hectares with production 7.90 million bales and Sindh was on 0.640 million hectares and 4.60 million bales production (Cotton Review, 2020). The cotton has been challenging crop for Pakistani growers due to various factors, ultimately causes decline in seed cotton yield (Choudhary *et al.* 2017 and Nachimuthu *et al.* 2017). Significant difference of various characters in cotton is due to sowing of different cotton genotypes/varieties (Afzal *et al.* 2002). Major difference of cotton traits is due to performance of varieties (Hanif *et al.* 2001). Sezener *et al.* (2006) also reported that significant variation in seed cotton yield is due to varieties. Therefore, keeping in view the cotton crop importance and different response of cotton varieties, the present research was carried out to evaluated 27 cotton genotypes and identify most promising variety for commercial cultivation to boost-up cotton production and utilization in hybridization and breeding program to transfer the traits and improve the characters.

OBJECTIVES: The main objective of this study was to assess the cotton genotypes at the environmental condition of Sakrand, Sindh and best genotypes which produce high yield with better fiber traits that could be used commercial to boost up cotton production and good stuff also utilized for breeding program to evolve high yield variety with desirable fiber traits. The significant variation was recorded in mean performance of genotypes for all the characters which suggested that varieties are statistically differ from each other.

MATERIALS AND METHODS: The trial was conducted at experimental farm of Central Cotton Research Institute Sakrand, 27 advance cotton genotypes were tested in National Coordinated Varietal Trial (NCVT) during the 2018-19 for yield and fiber traits at the environmental condition of Sakrand. The experiment was conducted with randomized complete block design with three replications. The plot size was maintained 30'x10. The seed was planted on ridges with plant to plant and row to row distance was maintained at 30 cm and 75 cm respectively. The agronomic practices viz. weedicide, irrigation, thinning and inter-culturing were done uniform accordingly in all the replications. The fertilizer and plant protection measures were applied as per need whenever required. The 5 plants were tagged from each replication to record the data. The traits were studied viz. plant height, sympodial branches plant^{-1}, bolls plant^{-1}, boll weight, seed cotton yield (kg ha^{-1}), ginning outturn, staple length, micronaire value and fiber strength. The significance difference of genotypes were tested through using method suggested by Steel and Torrie (1980) and the comparison of means were tested by Duncan Multiple Range Test (DRMT) at 5% and 1% probability by using statistical computer software application Statistix.8.1.

RESULTS AND DISCUSSION

The significant difference was observed among all the genotypes of yield, its contributing traits and fiber quality traits at 1% and 5% probability, which indicated sufficient genetic diversity, were present in the material (table 1). The significant variation was recorded in mean performance of genotypes for all the characters. Regarding the plant height (figure 1), the tallest varieties was observed NS-191 given (107.2 cm), while lowest was given by NIAB-898 (85.2 cm). The variation in plant height among various cotton genotypes were due to significant difference in genetic makeup of strains. Similar findings were reported by Anwar *et al.* (2002), Corpur (2006) and Ashokkumar and Ravikesavan (2011). Cotton breeders and farmers prefer medium height varieties due to lodging. Therefore, selection of varieties should be based on medium plant height. The *per se* performance of sympodial

Table 1: Analysis of variance means performance and statistical analysis of yield and fiber traits of cotton.

Traits	Replication	Genotypes	Error	CD 5%	CD 1%	CV %
	DF-2	DF-26	DF-52			
Plant Height	51.308	99.664**	42.591	10.53	14.03	6.75
Sympodial Branches	13.823	14.531**	6.753	4.20	5.59	9.86
Bolls Plant^{-1}	66.952	112.107**	44.066	10.87	14.49	8.51
Boll Weight	0.0267	0.4587**	0.082	0.47	0.62	7.84
Seed cotton Yield	38971	657178**	10775	170.07	218.5	4.36
Ginning Outturn	0.011	21.515**	0.327	1.39	1.85	4.50
Staple Length	0.583	3.332**	0.245	0.81	1.08	2.87
Micronaire Value	0.007	0.3418**	0.0103	0.17	0.23	2.58
Fiber Strength	0.0414	6.205**	0.709	1.37	1.83	3.05

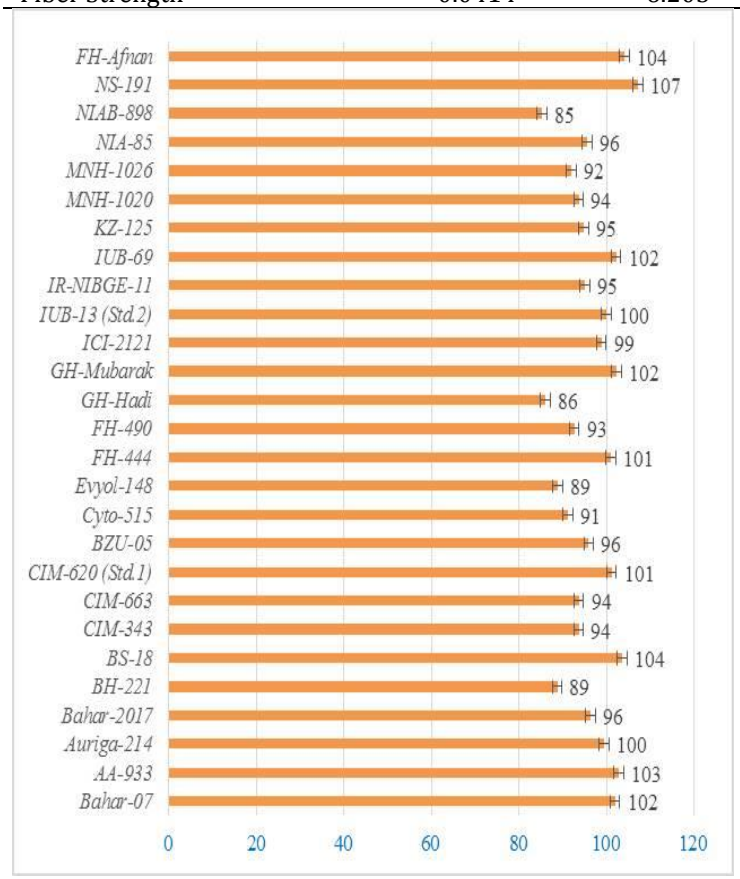

Figure 1: Plant height.

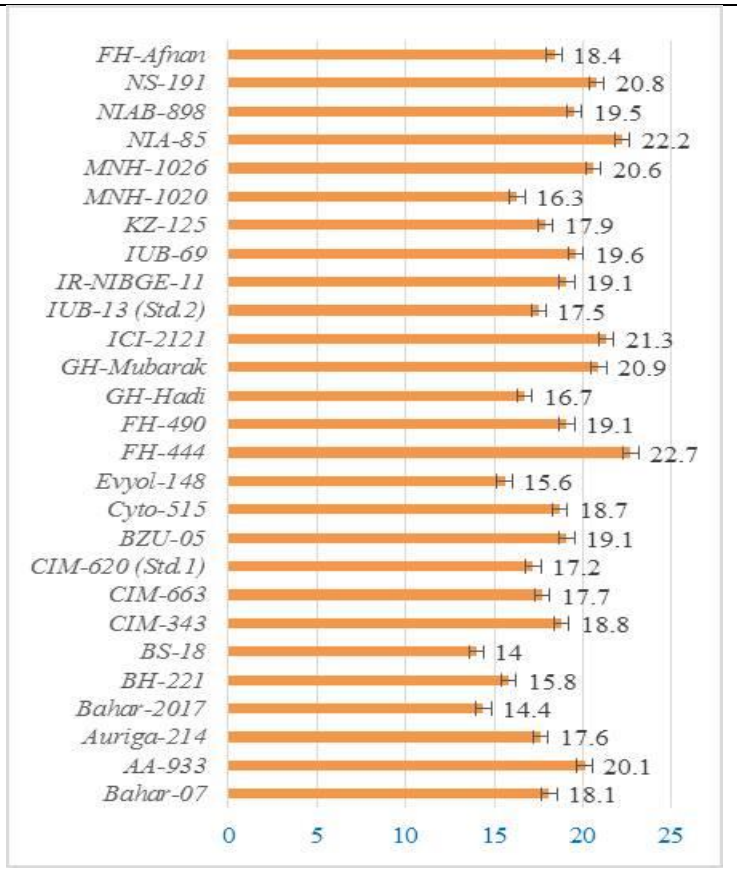

Figure 2: Sympodial Branches

branches (figure 2) revealed significant variation among cultivars, FH-444 given maximum sympodial branches (22.7). It was statistically at par with variety NIA-85 (22.2). While, minimum was noted in strain BS-18 (14.0). The results are in accordance with Corpur (2006), Ehsan *et al.* (2008) and Ashokkumar and Ravikesavan (2011).

Bolls plant^{-1} considered as important character that has direct effect on seed cotton yield. Among the varietal performance GH-Mubarak formed maximum (46.0) number of bolls plant^{-1}, followed 45.4 and 43.2 given by varieties AA-993 and NIAB-898 (figure 3) as compared with standard check varieties, CIM-602 and IUB-13. While, minimum number of bolls plant^{-1} produced by BS-18 (22.8), which indicated that variety could not perform well in Sakrand environment that could be due to stability and changing environmental condition. Boll weight is also an important trait which contributed in seed cotton yield. Out of 27 genotypes FH-444 given bigger boll and stood top as compared with other advance cotton genotypes and standard check varieties. The smaller boll weight was weighted in variety NIA-85 (figure 4). The character seed cotton yield place a unique position as compared to other traits. It is a joint contribution of other traits and their direct effect on increasing and decreasing yield. All the cotton genotypes were statistically differ from each other. The utmost seed cotton yield was produced by genotypes ICI-2121 (3279 kg ha^{-1}), followed by GH-Hadi (3135 kg ha^{-1}) and NIAB-898 (3087 kg ha^{-1})which were highest among all other genotypes as well as comparison with standard check varieties CIM-602 and IUB-13 (figure 5). Whereas, the lowest seed cotton yield was given by BZU-05 and IUB-69 which were below from standard check varieties. The results indicated that every genotype performed in different way at the environmental condition of Sakrand on the basis of varietal genetic makeup, characters, stability, environmental condition and might be soil factors. Therefore, it is suggested that varieties which possess higher boll plant-1, boll weight and seed cotton yield could be preferred for commercial cultivation

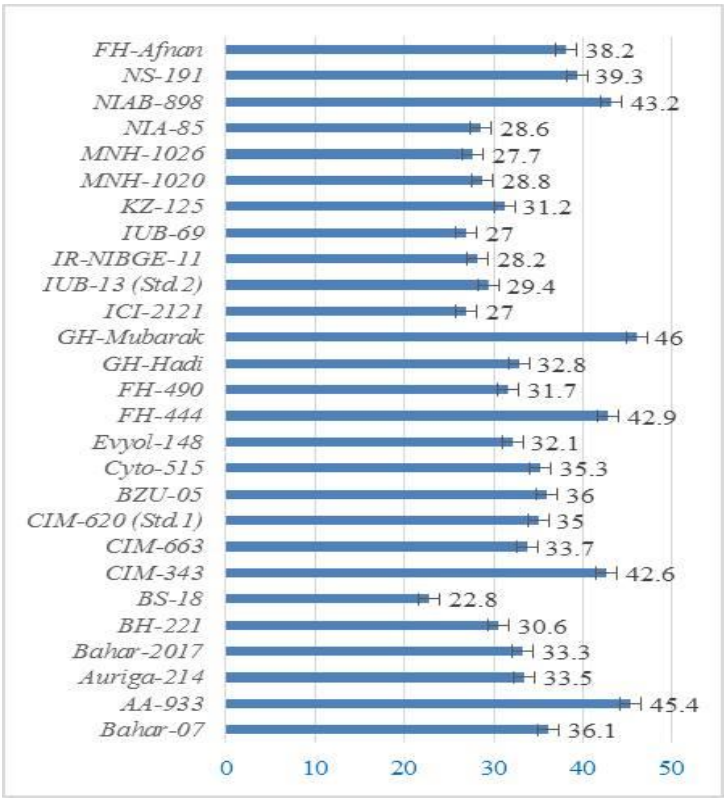

Figure 3: Bolls Plant^{-1}

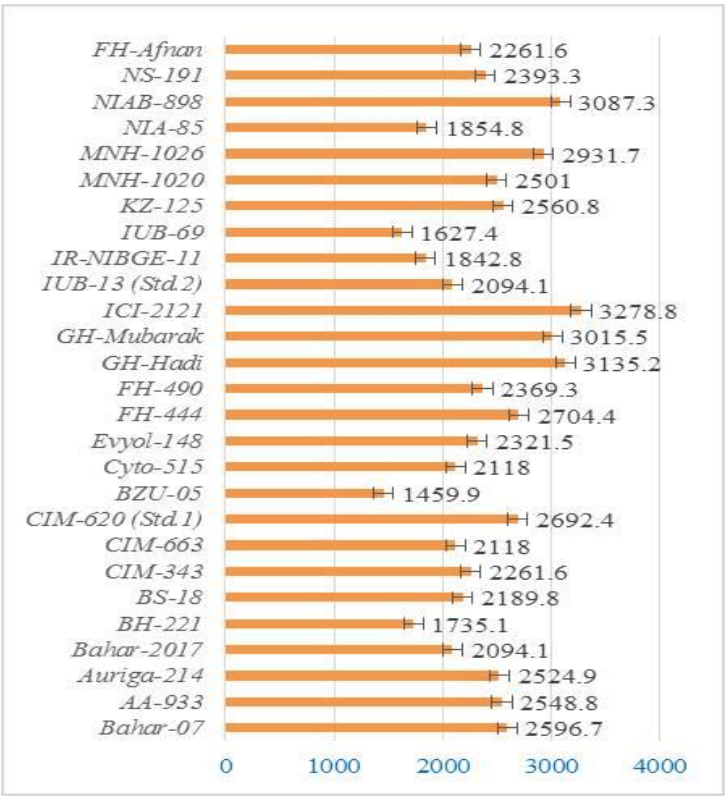

Figure 5: Seed cotton yield.

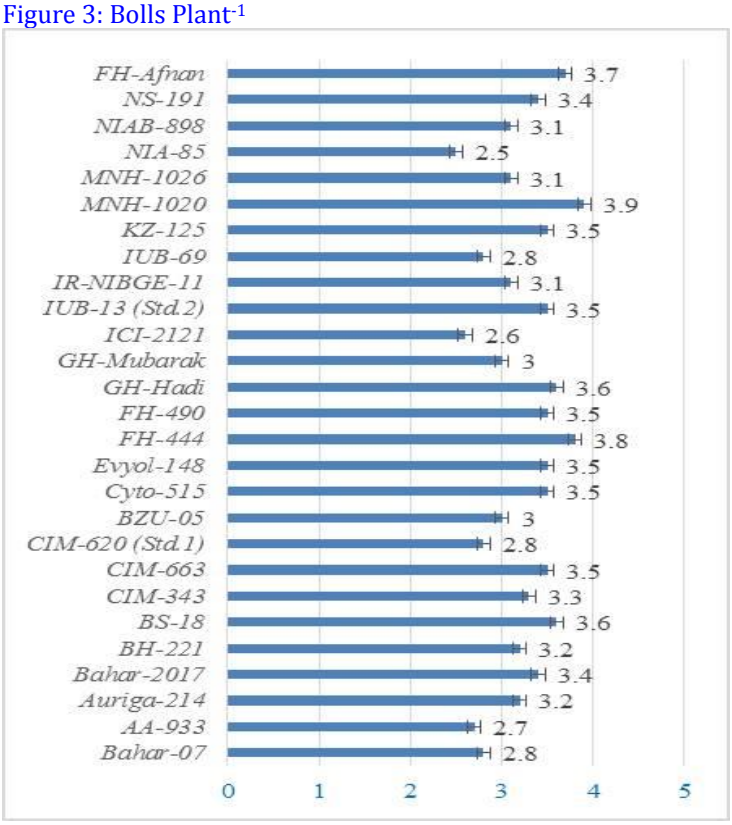

Figure 4: Boll Weight

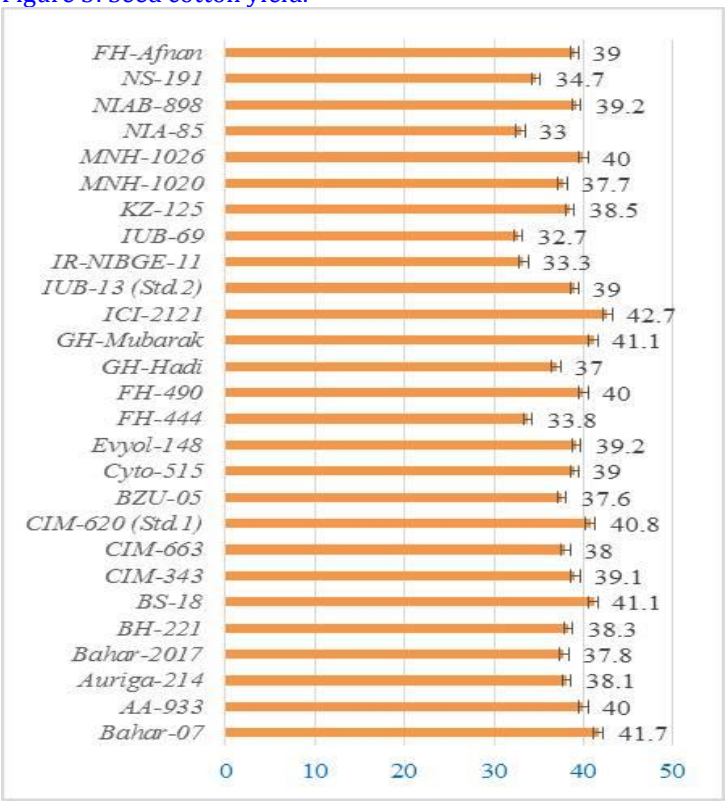

Figure 6: Ginning outturn

as well as utilization in breeding program to improve the characters. Corpur (2006), Ehsan *et al.* (2008) and Ashokkumar and Ravikesavan (2011) also reported significant difference among varieties for bolls plant^{-1}, boll weight and seed cotton yield. Hofs *et al.* (2006) documented variation in boll weight due to varieties. Khalid and Mueen-u-Din (2018) found variation in mean performance of genotypes for bolls plant^{-1}, boll weight and seed cotton yield. Kairon *et al.* (2000), Koutu and Shastry (2004), Khan *et al.* (2008), Shah *et al.* (2015) and Sekloka *et al.* (2018) described stable cotton genotypes with high potential for seed cotton yield in particular zone.

Data pertaining to ginning outrun per se performance (figure 6) indicated that ICI-2121 ginned higher ginning outturn (42.7%) followed by Bahar-07, BS-18 and GH-Mubarak compared with

standard check varieties CIM-602 and IUB-13. While, nine advance strains lowest ginning outturn which was below than standard. The results of varieties for ginning outturn was found statistically differ from each other. The results are supported with Wang *et al.* (2004), Ehsan *et al.* (2008) and Ashokkumar and Ravikesavan (2011). The comparison of treatment means indicated that varieties had significant effect on staple length. The longest staple length was measured in genotype NIAB-898 (28.2 mm) and NS-191 (28.1 mm) as compared with standard check varieties CIM-602 and IUB-13. However, out of twenty five advance genotype only two genotypes given staple length more than set standard (figure 7). As regards the trait fiber strength (figure 8), the strongest fiber strength was noted in genotype NS-191 and FH-Afnan as compared with other genotypes and standard check variety.

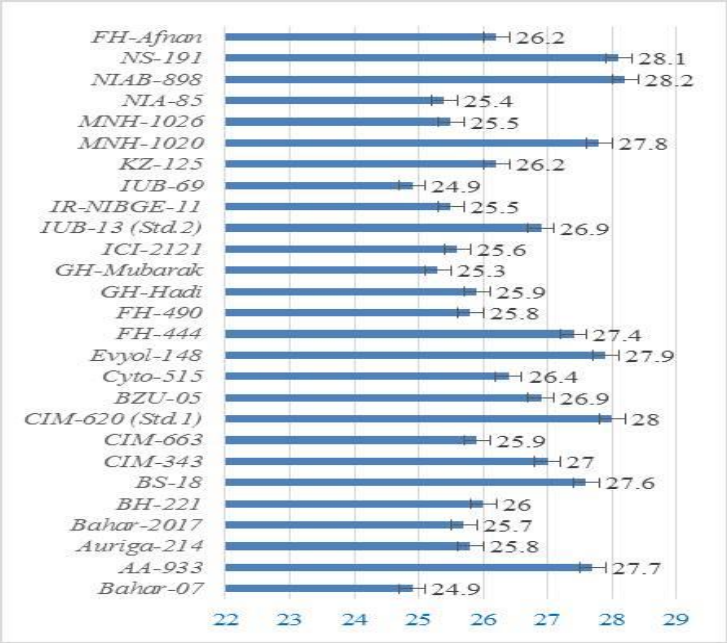

Figure 7: Staple length

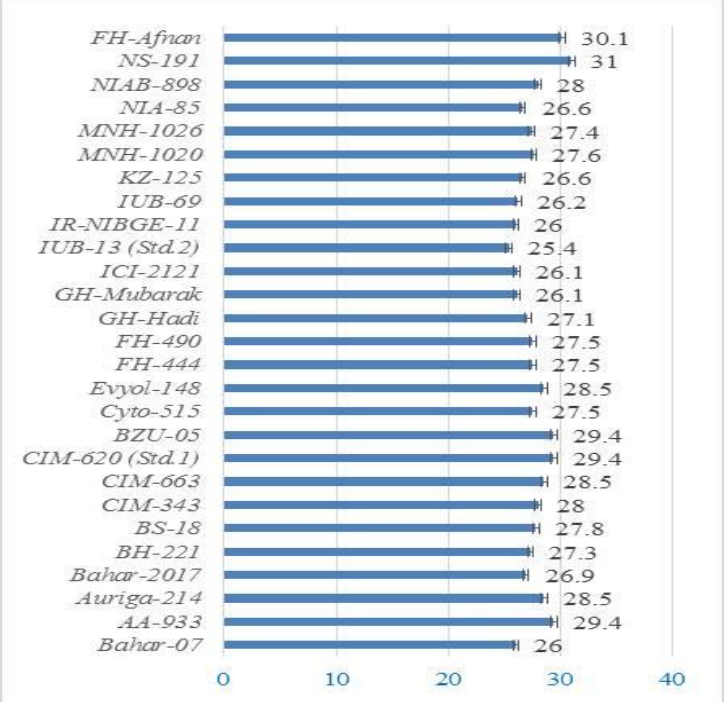

Figure 8: Fiber strength

Fiber fineness/micronaire value is an important trait in fiber quality parameters and is very valuable for textile industry. The significant difference in mean performance was observed for micronaire value (figure 9).

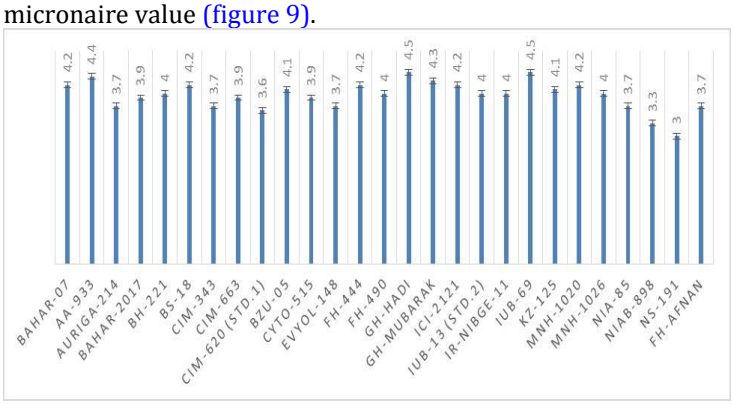

Figure 9: Micronaire value

The genotypes NIAB-898 and NS-191 declared as best which produced fineness fiber 3.0 and 3.3 respectively, as compared with other genotypes and standard check varieties CIM-602 and IUB-13. The findings are agreement with those of Copur (2006), Ehsan *et al.* (2008) and Ashokkumar and Ravikesavan (2011), Khokhar *et al.* (2017).

CONCLUSION: It was concluded that ICI-2121, GH-Hadi and NIAB-898 are high yielding cotton genotypes, these are suggested for commercial cultivation at the environmental condition of central zone of Sindh to boost up cotton production and at the same time utilization in hybridization and breeding program to evolve high yielding variety. For the fiber quality traits NIBA-898 and NS-191 are suitable genotypes to meet the criteria of textile sector.

REFERENCES: Afzal, M., M. Arshad, M.I. Khan and N. Illahi. 2002. Yield response of indigenously evolved upland cotton genotypes for various traits in National Coordinated Varietal Trials (NCVT) under Multan conditions. Asian Journal of Plant Sciences. 1(2):119-120.

Anwar, A.M., M.I. Gill, D. Muhammad and M.N. Afzal. 2002. Evaluation of cotton varieties at different doses of nitrogen fertilizer. The Pakistan Cottons. 46(1-4):35-41.

Ashokkumar, K and R. Ravikesavan. 2011. Morphological diversity and per se performance in upland cotton (*Gossypium hirsutum* L.). Journal of Agriculture Sciences. 3(2):107-113.

Choudhary, F.K., R.M. Rivero, E. Blumwald and R. Mittler. 2017. Reactive oxygen species, abiotic stress and stress combination. Plant Journal. 90(5): 856-867.

Corpur, O. 2006. Determination of yield and yield components of some cotton cultivars in semi-arid conditions. Pakistan Journal of Biological Sciences. 9(14):2572-2578.

Cotton Review. 2020. Monthly statistically bulletin, Pakistan Central Cotton Committee. 53(12):1-12.

Ehsan, F., A.A. Muhammad, A. Nadeem, M. Tahir and A. Majeed. 2008. Comparative yield performance of new cultivars of cotton (*Gossypium hirsutum* L.). Pakistan Journal of Life Society Sciences. 6(1):1-3.

Hanif, M., M. Arshad, M. Afzal and M.I. Khan. 2001. Yield response and yield parameters of newly developed cotton varieties of G. *hirsutum* L. Baluchistan Journal of Agriculture Sciences. 2(1):9-13.

Hofs, J.L., B. Hau and D. Marais. 2006. Boll distribution pattern in Bt and non-Bt cotton cultivars: I. Study on commercial

irrigated farming systems in South Africa. Field Crops Resarch. 98(2&3): 203-209.
Kairon, M.S., P. Ramasundaram and M.V. Varugopalan. 2000. Agenda for new millennium. Hindu Survey of Indian Agriculture. P. 109.
Khalid, L. and Mueen-u-Din. 2018. Efficacy of different high yield cotton varieties in ecological zone Bahawalnagar. International Journal of Compare Research and Biological Sciences. 5(7): 31-36.
Khan, N.G., M. Naveed and N.I. Khan. 2008. Assessment of some novel upland cotton genotypes for yield constancy and malleability. International Journal of Agriculture Biology. 10(1): 109-111.
Khokhar, E.S., A. Shakeel, M.A. Maqbool, M.W. Anwar, Z. Tanveer and M.F. Irfan. 2017. Genetic study of cotton (*Gossypium hirsutum* L.) genotypes for different agronomic, Yield and quality traits. Pakistan Journal of Agriculture Research. 30(4): 363-372.
Koutu, G.K. and P.P. Shastry. 2004. Characterization and identification of productive and high quality cotton species/genotypes cultivation practices suitable for different rain fed agro-ecological situations through farmer participatory program. Proceed. International Symposium on: Strategies for cotton production-A Global Vison-1:213-215. 23-25 Nov. 2004. India.
Nachimuthu, G. and A.A. Webb. 2017. Closing the biotic and abiotic stress-mediated yield gap in cotton by improving soil management and agronomic practices. In: Senthil- Kumar, M. (Ed.), Plant tolerance to individual and concurrent stresses. Springer India, New Delhi. pp. 17-31.
Ozyigit, I.I. 2008. Phenotypic changes during in vitro organogenesis of cotton (*Gossypium hirsutum* L.) Shoot tips. African Journal of Biology. 7(8):1145-1150.
Sekloka, E., A.K. Sabi, V.A. Zinsou, A. Aboudou, C.K. Ndogbe, L. Afouda and L. Baba-Moussa. 2018. Phonological, morphological and agronomic characterization of sixteen genotypes of cotton plant (*Gossypium hirsutum* L.) in rain-fed conditions in Benin. Journal of Plant and Breeding Crop Sciences. 10(2): 33-40.
Sezener, V., T. Bozbek, A. Unay and I. Yavas. 2006. Evaluation of cotton yield trials under Mediterranean conditions in Turky. Asian Journal of Plant Sciences. 5(4):686-689.
Shah, S.A.Q., S. Samiullah, S. Ahmed, A. Qader, S. Ahmed and A. Hakeem. 2015. Seed cotton yield performance of some candidate cotton varieties in national coordinated varietal trials in Sindh province. Life Sciences International Journal 9(1,2,3&4): 3121-3124.
Steel, R.G.D. and J.H. Torrie (1980). Principles and procedures of statistics: A biological approaches. 2nd Edition. McGraw hill, Book Co., New York, Toronto, London.
Wang, C., A. Isoda and P. Wang. 2004. Growth and yield performance of some cultivars in Xinjiang, china, an arid area with short growing period. Journal of Agronomy Crop Sciences. 190(3): 177-183.