INTRODUCTION

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Wheat belonging to family ***Poaceae*** is one of the most important cereal crops with regard to its qualities and use as human food especially in India, where it stands next to rice in area as well as in production. In fifties it was grown on limited area. But after ***Green Revolution*** wheat was sown under a wide range of edaphic and climatic conditions. It provides about 20 percent of total food calories to wheat will continue to increase in future to meet out the constantly increasing demands of food habits is primarily responsible for this increasing wheat demand. Among the cultivated species of wheat, two species, viz., bread wheat ***(Triticum aestivum L em Thell)*** and durum wheat **(T *durum* desf)** occupy 90% of the area and production as well.

India is one of the major wheat growing countries of the world. Wheat cultivation in India extends from about below 9°N Palini Hill in Tamil Nadu to about 3°N of Jammu and Kashmir (Tandon and Rao, 1986). India has witnessed a phenomenal increase in wheat production in a short period of about 30 years. The development of dwarf spring wheat types like Lermaroja-64, Sunera-64 by Borlaug and his colleagues by using Norin 10 genes and their introduction in India in 1963 along with Roja-64 and Sunera-64 indeed triggered Green Revolution because Indian scientists also made a significant thrust in the development of high yielding irrigation and fertilizer responsive varieties like PV-18 Kalayan Sona and Sonalika. Lerma Roja-64 and Sunera-64 released in

1965 for commercial cultivation formed basis of wheat revolution in India. By the end of 1980, 80% wheat crop of South and South-East Asia was planted with their high yielding varieties. The result of green revolution was evident in phenomenal gains in food grain production. In our county the productivity of wheat rose from 0.8 t/ha in 1963 to 2.7 t/ha in 2004. The wheat production that was 12.6 mt during 1966-66 has now reached to 79.8 mt in 2001 (FAO, 2002). Expansion in area with increase in productivity simultaneously resulted in an increase of net availability (per capitum) of wheat from 42.5 kg/year during 1967 to 67.9 kg/year during 1996-97 (Singh et al., 1997).

Wheat production statistics of the last 10 years in India is as follows:

Year	**Area (m/ha)**	**Production (m/tone)**	**Productivity (Q/ha)**
1995	25.70	65.77	25.60
1996	25.00	62.10	24.80
1997	25.90	69.40	26.80
1998	26.70	66.30	24.90
1999	27.50	71.30	25.90
2000	27.50	76.40	27.80
2001	25.70	79.70	27.10
2002	26.30	72.80	27.60

2003	24.90	65.10	26.20
2004	26.60	72.10	27.10
2016-17	31.78	98.38	
2017-18	30.42	94.00	

***Source-FAO**

The decrease in productivity growth is evident form the above table. It fell from a healthy 3.57 percent a year in 1980's to 2.11 percent in the 1990's and further crashed to mere 0.73 percent in the first three years of this decade. While yields are under threat in some states. The total area under wheat cultivation is also marginally lower than last year and much below normal levels. At present, on a year-on-year basis official estimates show that wheat acreage is down by almost 4.27% is area (Wheat Update, July, 2017-18).

To feed the ever increasing human population and to meet the targeted demand of 109 mt by the year 2020 AD (Nagarajan, 1997), the production trends will not only have to be sustained but also to be increased.

The increases of production and productivity has been the result of the development and cultivation of semi-dwarf and input responsive varieties along with the use of high purity/quality seeds. By t he end of this century a challenge has to be faced by the plant breeders to feed upon an effective population of more than 1 billion people of our country. This can only be overcome by breaking down the present yield stability plateau with the help of new high-yielding varieties which can equally perform well under diverse climatic conditions.

To take the wheat revolution further, plant breeders are striving to evolve wholly new plant types (NPT) of wheat, besides hybrid wheat, having the potential to yield around 8 tonnes per hectare, The new plant would have a longer earhead to accommodate at least 80 well filled grains, a deep and functionally efficient root system and a strong stem to support the heavier grain weight.

Besides, it would have a shorter life-span to vacate the field early and would also be immune to diseases and pests. Its grains would have good chapatti-making qualities. Such a plant, if developed soon, would not only push-up production for meeting local consumption and export requirements but would also help spare some land for other uses.

In order to achieve t his targeted plant type, plant breeders have to screen either naturally occurring genetic variability which has already been exhausted or should create the same artificially by using conventional methods of hybridization. The later involves the selection of probable parents (eco-geographically and genetically diverse) whose hybrids are expected to show better performance as compared to existing ergonomically accepted varieties. These hybrids upon selfing will definitely release a huge treasure of genetic variability upon which selection for high yield and ability to perform efficiently under diverse climatic conditions can operate effectively.

Further, the genetic base can also be broadened by using alien species of Triticum during wheat improvement programme (Pal, 1951, 1954, Joshi and Singh, 1979).

The tetraploid triticum species are well known for their intrinsic tolerance to drought, tough glutin, source of disease resistance and a very impressive range of variability in important yield components. The breeding potentiality of these species is yet to be exploited for further improvement.

Compared to aestivum far less breeding efforts have been made in durums which are most important from practical point of view (Breth, 1975). The *durums* are known for their high seed weight. The breeding potentiality of the *durums* is yet to be exploited for yield improvement of wheat cultivars. Use of various species of *triticums* in crosses with wheat cultivars of both sestivum and *durum* help in generation of new variability with respect to yield components. Availability of large variability and derivatives excelling in various yield componets would go a long way in modifying association among yield components that help in reduction the component compensation effects. Such as approach of introgression bredding would be very useful in further boosting the yield levels of cltivars of both *aestivum of durum* types (Joshi, 1973; Frey, 1976).

The most importact step for breeding programme in any crop plant is the selection of the parents to be included in hybridization. If the character is qualitatively erited, the selection of parents is straight forward and does not require any special technique. But in the case of quantitatively inherited characters such as yield and its components which are polygenically controlled, the selection of parents becomes very difficult. The suitability of parents can be judged best by their performance during yield trials and various systems of crossing programmes.

As yield is a polygenically controlled complex character and highly influenced by the environment, it will be difficult, but of course not impossible to augment yielding ability of any cultivar with out knowing the genetic background of various, directly and indirectly, contributing yield characters. The understanding of beneficial side effects such as those associated with awns in wheat provide a positive method for improving varieties in yields and/or its component characters that are difficult to be identified among the segregation products the hybridization. It should, however, be recognized that the series of events initiated by hybridization can have both favourable and unfavourable effects and that all the phenomena of Mendelian Genetics like segregation, recombination, linkage, non-allelic interactions, penetrance, expressibility threshold etc, do have a brearing on both the success and failure of any hybridization programme considered for improvement of any crop.

The basic objective of the breeder is the production of genetic population, that is, superior in specific ways to those already in existence. The materials for the creation of such a population are genes that can be introduced into interbreeding groups of organisms by cross fertilization. The function of se is to produce individuals whose genotypes represent optimum combination of the available favourable genes and to device breeding systems with which these superior genotypes can be reproduced at will.

For the implementation of hybridization programme and for its desirable consequences, the breeder is likely to face some of the following inevitable problems:

1. *Selection of suitable traits as present from amongst the existing collection of germplasm.*
2. *Quick and reliable assessment of capabilities of hybrids and their derivatives.*
3. *Follow up of appropriate procedure to handle the subsequent segregating population.*

The assessment of the desirability of parents to be used in any breeding programme is indispensable and can be done through the knowledge of genetic system controlling the inheritance of characters in question. The performance of the germplasm is often considered a good enough criterion for selecting parents for hybridization programme. But it has been observed, as apparently, looking parents do not ‘nick’ or combine well enough to yield promising isolates in their hybrid progenies. The combining ability of parental varieties or strains to be used in hybridization is, therefore, an important line of study in yield breeding.

Choise of parents with wide genetic variability for different characters would lead to combination with more than one desirable character. The magnitude of heterozygosity which differ in various cross combinations and high manifestation of vigour in F_1 may not necessarity laead to a large proportion of segregates showing high transgressive segregation. Progressive selection in hybrid progenies would, therefore, be ensured by knowledge of genetic systems involved in the inheritance of particular characters.

It is now very well conceded that the performance of the parents themselves or than of their hybrids does not always give any indication of the probable performance of the pure lines which cab be selected out of the progeny of such crosses. Hybrids form certaients express well and produce superior offsprings, while hybrids from others apparently having equally desirable characters, may produce disappointing progenies. Superior cross combinations may not be recognized until several of their generations have been screened and such effort is made ini the evaluation of the crosses of selection during early generations. An early appraisal of germplasm of individuals' segregants in the hybrid population permits the rapid elimination of inferior segregants and thereby enhances the probilities of obtaining desirable combinations by concentrating attention on the few crosses which have to show maximum potentialities. For this purpose, ***line X tester Cross Analysis*** recently developed and modi enables the breeder to draw their conclusions on the basis of genetic architecture of parents for a particular character. The method serves as a powerful tool for the plant breeders in the study of the inheritance of quantitative characters.

The analysis gives information about ***general and specific combining ability,*** the term first used by Sprauge and Tatum (1942), the average additive effects of the genes, the effects of heterozygosity, dominance raletionship of the genes in the parents under study and their interaction by using data form the F_1 and later generations. In cases where non-additive gene effects are operation this method can justity whether dominant genes, recession genes or a balanced grouping of dominants and recessives are responsible for high manifestation of characters under study.

The line X Tester Analysis also reveals the functional proportion of dominant and recessive genes present in the parents, which enhance the chances of obtaining transgressive segregates for a particular combination of parents. Thus, this method is useful in obtaining a rapid overall picture of the genetical relationship among a number of gentotypes and is, therefore, useful to the breeders to predict the future desirable early crosses likely to be continued for next segregation populations.

Genetic advance under selection is the corner stone of a population of animal and plant improvement. Efficient selection of genetically superior individuals requires adequate phenotypic variance in the base population and sufficient high heritability (transmissibilities of characters from parents to offspring). The increase in heritability and phenotypic variance is usually associated with increases in the genetic gain under selection.

From, genetic point of view, it is difficult to bring about simultaneous improvement in all the component characters as some of these may be negatively associated. Knowledge of the relationships among the various component characters and their direct and indirect effects on each other is necessary, if selection for concomitant improvement of these traits is to be made effective. Thus, correlation studies among these components are of basic importance to a breeder for planning a directional improvement in any crop. The estimation of genotypic and phenotypic correlations among important characters may reveal that some of the later are useful indication of one or more of the former.

The ***Correlation Coefficient***, a measure of the analysis of correlation in a system of related variables is simply a standardised partial regression coefficient and as such measures the direct influence of one variable upon another and permits the separation of the correlation coefficients into component of direct and indirect effects. Through these analyses, the genetic stock of any crop can be evaluated fully for its utilization for practical purposes.

Since most of the genotypes of aestivum and durum wheats lack the genetic information required for launching an efficient breeding programme, the present study, which deals with general and specific combiing ability effects, genetic component of variances and their ratio, heterosis, genetic advance, correlation and path coefficient analysis, has been under taken to evaluate the germplasm.