CHAPTER - II

REVIEW OF LITERATURE
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A brief review of work done in breed barley and related crop for yield and its components which have direct relationship with the present study, is given below.

1. **VARIABILITY** :

Maluszynski, M. et al. (1983) observed that in a collection of 150 dwarf and semidwarf mutants, plant height was investigated in relation to stem, neck and ear length.

The possibility of mutation affecting each of these features independently was demonstrated. Stem length showed the closest association with height, but tall plants with short stems were found. The association between height and each of the other traits was slight. In general, shorter plants gave lower grain yields. It is concluded that the selection, from collections of mutants, of lines which combine high yield with preference combinations of height and other dimensions is a practical possibility.

Asthana, A.N. et al. (1984) observed that in 20 indigenous varieties of eleusine coracana from Sikkim and 20 varieties selected from the all India co-ordinated varietal trial, Genotypic variance was found to be more important than error variance for days to flowering and maturity, plant height number of fingers on main tillers,
length of finger and grain yield per plant. The genetic coefficient of variability was high for grain yield and finger length, which with days to flowering and maturity showed high broad-sense heritability estimates (92-98%). Estimates of genetic advance indicated that direct selection for yield would be most effective, followed by selection for finger length, day to flowering and maturity, number of fingers on the main tillers and plant height.

Wegrzyn, S. et al. (1984), observed that the tall varieties cryf and MGZ. Ackerman were crossed reciprocally with each other and with two dwarf varieties, Diamant and colden promise, data on height, the length of the highest internode, the number of grains per ear, 1000 grain weight and grain weight in the main ear, recorded in the initial material and in the F$_2$ were analysed by several different methods. The dominance of greater height was establish, and the dominance or over dominance of a lower number of grain per ear, Broad-sense heritability was high (7.50 X) for height and 1000 grain weight in all crossed, but in MGZ Ackerman X Colden promise high values (57.6 - 66.9%) were obtained for all the characters studied.

Ceccarelli, S. et al. (1985) obse ved that in studies of ear to row progenes of 14 accessions of the spontaneous, there was significant genetic variation between and within
accessions for most of the characters studied (height, days to flowering, number of tillers, number of internodes, grain weight and reaction to *Rhynchosporium secalis* and *Puccinia hordeia*). The amount of genetic variation within accessions also varied.

Ruiz, M.L. (1986) observed that the topic is reviewed under that following heading, collus types in barley variation in chromosome number, chromosome number in plants regenerated from barley callus, and genetic variability through barley callus.

2. HERITABILITY AND GENETIC ADVANCE:

The concept of heritability is important to determine whether the phenotypic differences observed among various individuals are due to genetic change or the effect of environmental factors. According to Luse (1940) heritability Board sense, it is the ratio of total genetic variances to phenotypic variance. In a narrow sense, it is the ratio of additive genetic variances to phenotypic variance.

Dudley, J.W. et al. (1967) Plant breeding programme can be divided into three stages:

1. Creation of a pool of variable germ plasm.
2. Selection of superior individuals from the pool, and
3. Utilization of selected individuals to create a superior
variety. Estimates of genetic variance and heritability can be inevitable in all the three stage. The methods for the estimation of heritability are parent off regression (Fisher 1918, Luse 1940, Robinson, et al. 1949). Variance components (Fishar 1918, Mathes 1949) use of genetically uniform population Luse 1948), use of F₂ and back cross procanies (Fray and Horner 1957) Constant parent regression (Criffling 1950), Component analysis (Rumpeckes and Allard 1952) and estimate of combining ability variance (Curnow 1961 et al.). Genetic advance or genetic grain is still a more useful estimate. It is important for genotypic value in new population, in contrast to the post population. The genetic grain depends upon.

The amount of genetic variability i.e. the magnitude of differences among different individual in the base population.

The magnitude of masking effect the environmental and interaction components of variability on the genetic diversity, and the intensity of selection (Comstock 1952) et al.). The genetic grain is a product of heritability and selection differential expressed in term of phenotypic standard deviation of that characters. Heritability and genetic advance both are the components of direct selection it is necessary to utilize heritability, estimates in
conjugation with selection differential which would indicate the expected genetic grain, the work done on the heritability and genetic grain in barley by various workers is summarised as under.

Glass, R.L. et al. (1967) reported high heritability estimates for days to heading and plant height and low heritability for yield.

Borthakur, et al. (1970). Reported that heritability of Karnal weight was 25.8% to 23.9% and genetic advance ranged from 6.5 to 14.2% high heritability in broad-sense and high genetic advance for grain yield and grains per spike were reported by Sethi and Singh (1971).

Nasr et al. (1972) observed medium to high heritability for 1000 Kernal weight and plant height and slightly low for grain yield.

Herry and Yap (1972). Reported high heritability both for agronomical as well as morphological traits.

Studies of Acikgoz (1973) also confirmed that heritability was significant for plant hight, grain weight and grain per plant.

Abo-Fi-encin et al (1975) observed in all the combinations that differences between broad-sense and narrow sense heritability were fairly small expressed can of spikelets per spike.
Dixit, et al. (1979) reported high heritability for days to heading, plant height, spikelet per spike and grain yield. Expected genetic advance in percentage of mean was maximum for Tiller's ear plant followed by plant height and grain yield.

Gulati and Murty, (1979). Reported high heritability for components traits, whereas, tiller's per plant, grain per spike and grain yield per plant bed low values.

Bainiwal, C.R. et al. (1984). Data are presented on the genetic components of variance for yield, Ear length and grain/ear from an 8 x 8 half diallal studied at Hissar, Gene effects were not altered by treatment (drilling Vs spaced planning, cutting vs no cutting).

Tong, Z.K. et al. (1984). In a study (1980-81) of 8 character's in 2 hybrid of six rowed barley and heading data hed the highest heritability value. Heritability for length of main ear, grain no. main ear differed significantly in the different hybrids, Heritability for heading data, length of main ear, grain number main ear and grain set of the trispiketele was higher in the two rowed hybrid and heritability for 1000 grain weight and ear number' per plant was highest in the six rowed hybrids, Expected genetic advance for ear number plant was relatively high in most of the hybrids and was positively correlated with the difference between the parents for all the characters.
Karim, M.A. and Yousif, N.K. (1986). Genetic variance data from work in Iraq for heights tiller number and grain yield and its components in the parental, F₁, F₂ and Back cross generations, of the H. distichon (Hordium vulgare L.) crossed clones x Bussele and A16 X aswad. Grain yield was mainly influenced by dominance and epistatic effects in A16 x asward and by additive and non-additive effects in clipper x bussels.

Singh, S.S. (1987). Days to 75% heading had the maximum direct effect on yield at the genotypic level and number of ear per plant at the phenotypic level in 11 varieties under irrigated conditions in rainfed conditions ear length, number of ear per plant days to 75% maturity, Number of spikelets/spike and number of grain per spike exerted a direct effect on yield of the genotypic level while number of ear/spike and number of grains per spike had the greatest effect at the phenotypic level, under sown conditions that grain yield was directly influenced by the number of grain per spike, plant hight days to 75% maturity and 1000 grain weight at the genotypic level and by all the character's except number of spikelet per spike of the phenotypic level. The expected genetic grains through selection using discriminant function were 17.4, 12.4 and 12.1% under irrigated rainfed and late sown conditions, respectively.
Singh, S.S. (1989). Yield and 8 yield component at pH 8.5–10.0 Heritability estimates and correlations among traits indicated that production tiller per plant day to flowering days to maturity and 200 grain weight would be the most useful selection criteria.

3. CORRELATION AND PATH ANALYSIS:

Tandon, J.P., Jain, K.B. and et al. (1968), expressed the genetic basis of the association between yield per plant, tiller/plant, grain/spike and 1000 kernel weight most of the association were found to be due to linkage, pleiotropy was established only in case of association between grain/ear and 1000 grain weight, environmental component of association were found to be considerable importance in several cases Corelation and Foote (1968) observed negative association of kernels head and weight of kernels.

Kulicenko, and et al. (1969). Reported a positive correlation between the 1000 kernels weight and grain/ear.

Usikova, A.A. (1969). The correlation and heritability and characters and spring barley, observed that the correlation between grain/ear and grain yield was higher then grain size and grain yield, Protein content was slightly related to grain size.
Nurty and et al. (1969). studied correlation coefficient between protein content and 1000 kernel weight, which was 0.68.

Sharma, D. (1970) observed that grain yield was positively and significantly associated with heading data. Plant height, productive tillers/plant, 1000 kernel weight and straw yield.

Sethi, G.S. and et al. (1971) observed that grain yield was positively correlated with spike per plant, grain/spike and grain weight.

Nikitanka, G.B. (1972) found positive correlation in early hybrid generations between protein content and husk characters. High positive correlations were also observed by Singh and Singh (1973) for grain yield with grain/spike, productive tillers, spikeletes per spike and ear weight.

Singh, M. and et al. (1973). observation of ten yield characters in 30 varieties indicated that number of tillers and ear weight had the most influence on grain yield.

Morri, M.I. and et al. (1975). Studied that grain weight was positively associated with height but was independent of head number and spike length, while it was negative associated with spikelete per spike, height was
independent of head number but positively associated with both spike length and spikelets/spike. Head number was also positively associated with spike length, and spikelets per spike, strong positive correlation between grain/plant tillers/plant, grain weight and plant height were recorded by Grafius and Cokli (1974), Jene (1976) and Nare and Khoyrallah (1976), Schols (1976) reported negative correlation between protein content and grain yield.

Samtha, I.M. and et al. (1979) observed negative correlation between grain weight and protein content.

Singh, R.B. and et al. (1979) revealed positive and significant correlation between harvest index and grain yield while harvest index had significant and negative association with days to heading, plant height and ear length.

Singh, S.K. and et al. (1979) observed that in a study of six characters in 60 indigenous and exotic genotypes grown in saline-alkali soil of pH 8.5 the genotypic correlation of spike length, grain number per ear, number of ear bearing tillers and harvest index with grain yield per plant were positive whereas that of plant height was negative. The number of ear bearing tillers showed the highest direct effect on grain yield per plant.
followed by harvest index but these direct effects were reduced by the negative indirect effects of plant height spike length and harvest index on the number of ear bearing tillers, and plant height, spike length and number of ear bearing tillers on harvest index.

Reinders, E. and Park, S.J. et al. (1980) observed data from an experiment with 20 homozygous lines (DCC, PEA 9635) were reanalysed using a path coefficient method. Heading data, plant height, number of grain per plot and grain weight were more variable in hill plots than in row plots. The coefficient of variation for number of grain per spike were similar in both plot types. In hill plots over a range of environment and densities, this characters was more highly correlated with yield than any other. The analysis indicated the importance of the number of grain per spike as determinents of yield.

Tewari and Chandra (1980). Twenty five varieties from the Bichpuri college were grown in 1976-77 and 78 seven characters were examined by path coefficient analysis data are presented on the yield components that made the greatest contributions to grain yield of the genotypic and phenotypic levels in each year indicated that only spikelet number/spike, 250 grain weight and number of ear bearing tillers/plant contributed more directly to yield in both years.
Khodzhakulov, T. (1980) observed that the results are presented of analysis or correlation between yield components. The coefficient of correlation varied according to environmental condition and agronomic practices, but successfully used as the basis for selection for high yield, grain set and tillers number.

Glukhovtsev, V.V. (1982). In a study of 10 stable lines of different origin (100 plant each), a positive correlation was found between number of grain from the main ear and yield \( (r = 0.87 \text{ in drought years and } r = 0.91 \text{ in wet years}) \). Number of fertile tillers was correlated with grain weight/plant \( (r = 0.93 \text{ in wet years and } r = 0.49 \text{ in drought years}) \), as was total tiller number \( (r = 0.61 \text{ under drought and } r = 0.46 \text{ in wet conditions}) \). It is concluded that procuture tillering froms may be better able to arthslad the unfavourable effect of drought and that is inadvisable to use varieties with weak tillering for breeding purposes.

Singh, R.R., Singh, R.V. and et al. (1983) Path coefficient of data on yield and 7 yield related characters in 32 varieties and this analysis in dicated significant differences between varieties for all characters. Number of grain per ear, test weight, ear length and days to flowering had the strongest correlation with yield.
Ayiecho, P.O. and et al. (1983). Grain yield, three yield components and grain nitrogen and moisture contents were investigated in a diallel cross with out reciprocals, involving four two rowed and three six-rowed varieties. Grain yield per plant and ear per plant, were positively correlated in both ear row types. In the two rowed parents, ear per plant and grains per ear contributed significantly to grain yield. Negative correlations were observed between grain yield and grain N content and between grain weight and grain moisture content.

Babayan and et al (1984) observed that seeds of 14 winted barley cv. differing in grain protein contents were grown in rolls of damp filter paper and polythene film. A close correlation between linear growth, dry out, of 10 to 12 days old seedlings and grain protein content was observed \( r = + 0.7 - 0.8 \).

Gupta S.C. and et al (1984) observed that in trials of 15 varieties grown on normal or saline soil, grain yield was strongly and positively correlated with number of tillers per plant and 1000 grain weight on normal soil and with germination and number of tillers per plant on saline soil.

Kirtok, Y. and colkepen, M. (1985). path coefficient analysis based on phenotypic correlation coefficient obtained in 5 years, trail involving a total of 49 varieties was applied
to yield per plant and seven related trails. The components contributing directly to yield differed according to year but 1000 grain weight, ear length and number of grains/ear generally had marked direct effect on yield.

Thomas, W.T.B. and et al. (1985). observed that phenotypic correlations were generally lower than the additive genetic correlations and occasionaly of different high yield per plant showed high dominance genetic correlation with grain number and 1000 grain weight. Additive and dominance genetic correlations confirmed associations of the erectaides dwarfin gene with low 1000 grain weight and yield.

Palsson, H. (1987). ear per m$^2$, grain per ear and 1000 grain weight were examined in about 300 spring barley breeding lines in 1987 and observed that all components showed considerable genetic variation in relation to environmental variation, but ears/m$^2$ was greatly affected by the environmental. The 1000 grain weight was closely correlated with yield ($r = 0.63$) probably because of lodging in many varieties resulted in poor grain filling, resistance to lodging shortly after heading was closely correlated ($r = 0.73$) with grain yield. The components were negatively correlated among themselves, making it difficult to identify one yield component to select it for yield improvement program.

Singh, M.K., Pandey, R.L. and Singh, R.P. (1987). On a saline soil (Ec 45 ds/m) 60 naked grained lines were
evaluated for yield and its components. Yield were significantly correlated with number of productive tillers, plant height and number of nodes/plant, days to heading and spike length had high and a positive direct effects on yield.

Larik, A.S. and et al (1987) correlation coefficient were calculated in all possible combinations between plant height, spike number, spikelesper spike, grain per spike and grain yield per plant in 5 cultivars spikelete per spike and grains per spike had a long positive association with grain yield. Path coefficient analysis and the computation of selection indices confirmed that spikelet per spike and grain per spike were the major components influencing grain yield and also indicated that selection based on these traits would be useful in producing high yielding cultivars.

Yadava H.S. and et al. (1988) path coefficient analysis of parents and F₁ of (Hordium vulgare L.) and results indicated that protein content and plumpness of grains, and protein content and 1000 grain weight had the greatest direct effects on grain yield in parents and F₁s respectively. In the parent & F₁s starch and crudefibre content of the grain, and plumpness in the latter case, showed direct positive effect on 1000 grain weight.

Kim, S.J., Chung, D.H. and et al. (1989). from the collection at the barley 131 lines were selected and subjected to principle components analysis, the first component seamed
to correspond to culm length, spike length and own 
length, the second to days to heading and maturity and the 
IIIrd and foruth the to spike length and yield components. 
The Q-correlation analysis assigned the lines to 11 
groups.