CHAPTER II
REVIEW OF LITERATURE

Available literature in the field of Horticulture revealed the good examples of variable factors in their different varieties (Nitsch et al., 1952). Growth factor is one of the fascinating problems of the biology. It has attracted the attention of Morphologists as well as comprehensive studies has been carried out to understand the morphology of this family but no systematic and planned work has been done on the proposed project of the present investigations the work already done so far on this crop is being reviewed as follow:

The Morphological as well as bud developmental preliminary investigations were conducted by Chakraverty (1949) and Prasad and Prasad (1978-79) in bottle-gourd, (Lagenaria Leucantha (Duch), Rusky and Lagenaria Siceraria (Mol.) Standl, respectively, where they observed that its flowers were found pentamersous and the stigma was recorded to be respective from 6 hours before to 36 hours after anthesis. The Malvaceae family has its own effect on its germplasm material. Some work has been done in scattered form which has not led for the final conclusion.

Nanipuri and Singh (1967), Singh and Singh (1970), Singh and Prasad and Prasad (1978) found the variations in bud development, anthesis and dehiscence aspects in the preliminary studies of some of the bottle gourd varieties and Okra crop.
Mathur and Nath (1978) while studying the floral biology of Luffa and Cucumis species recorded that in sponge and ridge gourd male and female buds took 17-21 days and 11-14 days, respectively for anthesis. Flowers opened in the morning in case of sponge gourd and snapmelon whereas in ridge gourd it was in the evening. Dehiscence was over in 30-40 minutes after anthesis. Maximum respectivity of stigma was on the day of anthesis. For Okra crop the anthesis factors have also their weightage.

In the last decade Thamburaj and Kamalanathan (1973) reported that in pumpkin (Cucurbita Moschata Poir) and ash gourd (Benincasa hispida (Thumb) cogn.) staminate flowers were found to appear first at lower node number than the pistillate flowers in these crops.

Hayase (1955) in egg plant (Solanum melongen L.) found that the minimum and maximum temperatures governs the anthesis and dehiscence, respectively, and that humidity or light intensity had no effect on these factors. Further he also found that anther dehiscence in this spp. could be accelerated by the high temperature treatments of the buds for two days or by setting the another wall at noon of the day proceeding anthesis. Vija et al. (1977) in Karkol (Momordica Cochinchinensis spreng) recorded that the male flowers bud took 22-24+ days
from visible initiation to full blooming stage while the female bud takes 19-22 days to full bloom. The stigma was found receptive upto eighteen hours before and after anthesis. However, these factors affect the growth and development aspects.

In the preliminary studies in *Momordica Charantia* L. Agrawal et al. (1957) reported that the optimum variability of pollen grains and receptivity of stigmas are the important ones for the fruit setting.

Jos et al. (1967) studied in Vitro germination of pollen grains in sacrifices where they observed that adding 200 ppm of boric acid to distilled water, the percentage of germination and length of pollen tube growth aspects were significantly increased. In certain species he found that pollen grains of nine varieties were found to differ only in their size. Cucumber pollen grains were found longer than those of melon but they do not differ structurally from the latter. Pollen of three species of water melon had three meridional furrows and reticulate exine.

Prasad and Batham (1975) in tomato (*Lycopersicon* *esculentum* Mill.) recorded that pollen size in acetocarmine media varies from 17.64 to 22.68 and 17.60 to 21.96 in distilled water. They were found to have three germ pores except few of them have one or two germ pores. The highest pollen viability (98.6%) was observed in variety Pusa Ruby in the month of December. Further, Prasad and Prasad (1979) in bottle gourd
(Lagenaria siceraria (Mol.) found that pollen grains were identical in morphological features. Pollen viability varied from 18.36 to 96.17 per cent and their size 53.48 to 65.92 μ among all the varieties. However, the maximum pollen germination with the highest pollen tube length was found in 30 per cent sucrose media in this crop.

Chadha, et al. (1972) in two crosses of muskmelon observed that the colour of rind, colour of flesh and juiciness showed monogenic control with dominance of green rind, colour of fresh and juiciness, showed monogenic control with dehiscence of green rind over yellow, white flesh over green flesh and less juicy flesh over juicy. Chadha and Manderi (1973) in muskmelon (Cucumis melo L.) observed that in both the crosses dominance variance was much more prevalent than the additive variance.

The degree of dominance showed over dominance. The heritability estimates were recorded high in both the crosses. Dhillon (1971) in Lagenaria recorded a positive and highly significant correlation between the sex ratio of the plant. Sex ratio of the staminate flowers which found positively correlated to the node number of the first pistillate flower and also to the period taken of appearances of first pistillate flower, while it was recorded negatively correlated with fruits per vine. OKRA crop has not been studies for other characters.
Brar and Nandpuri (1973) while studying on genetic analysis of yield and fruit number in watermelon (*Citrullus lanatus* (Thumb.) observed that low yield showed over dominance over the high yield and low fruit number which was partially dominant over high. Heritability estimates in Narrow sense which were also low and medium for yield and fruit number, respectively. The findings obtained by Carlson (1962) in cucumber, revealed that length of fruit had clear connection with the average weight.

Prasad and Prasad (1977, 1978) studied on variability and correlation in tomato and bottle gourd where they found the positive and significant associations of number of fruits per plants with yield per plant. Similarly, Singh and Nandpuri (1978) have studied on correlation in muskmelon and bottle gourd where they observed that characters which have high heritability were having the significant and positive correlation phenotypically as well as genotypically which suggested that the selection based on these characters will be more effective in improving the total yield per vine in muskmelon.

Singh and Singh (1977) and Singh and Rai (1981) while studying the heritability in chilli (*Capsicum annuum* L.) recorded high genetic advance in percentage of mean for number of branch fruit length and fruit thickness while for other it was low. Some traits showed low genetic advance though they had high heritability. A variability study in cabbage made by
Arunugam et al. (1978). In their study they recorded that weight of head, circumference and equatorial diameter of head recyled high coefficient of variability, heritability as well as high genetic advance.

Solanki and Seth (1980) in cucumber (*Cucumis Sativus* L.) found that a considerable amount of variability was observed in plant height, leaf number per plant, number of male flowers per plant, days to maturity and number of female flowers per plant. Association of high heritability with high genetic advance for plant height, leaf number per plant, number of male flowers per plant, number of female flowers per plant, internodal distance, days to maturity and fruit yield suggest additive gene effects.

Prasad and Prasad (1979) in bottle gourd (*Lagenaria-siceraria* (M.) Standl.) found that plant length (98.94 and 98.09 percent), and fruit diameter (98.27 and 98.73 per cent) showed high estimates of heritability. Maximum value of genetic advance was found for fruit thickness (78.99 per cent) and fruit length (78.20 per cent).

Further Prasad and Prasad (1981) in Turnip reported that heritability value ranging from 19.20 to 35.90 per cent exhibited high heritability with high genetic advance and had the most effective contribution for selection.

Ranga Swamy and Murugesan (1975) reported high correlation between plant height and leaf length, plant height and tillers in rice (*Oryza Sativa* L.) while studying with pea recorded a significant and positive correlation of yield with all of its components the findings of Choudhary et al. (1971) in peas (*Pisum Sativum* L.) revealed a positive association.
In Muskmelon (*Cucumis melo* L.) experiments of genetic variability and correlation, almost all the characters showed high heritability value. Flesh thickness showed value of genetic coefficient of variation heritability and genetic advance. Beside, above diameter of seed cavity was found strongly and positively correlated with flesh thickness and fruit length. Similarly fruit length also showed a strong and positive correlation with fruit diameter. Total soluble solids showed a very weak and positive association with all the characters.

In the trials of genetic variability and heritability in radish (*Raphanus satoves*), a wide range of phenotypic variability was found in almost all the characters, particularly fresh weight of top, length and diameter of root and root yield. All the characters revealed from 50.00 to 99.51 per cent for leaf width to dry matter in leaves (95.96%) followed by root length (55.64%) and the lowest genetic advance (14.56%) for number of leaves/plant.

Hautiyal and Prasad (1972) reported that selection of varieties is a needful for depending upon their suitability for region, best characters of variabilities which are contributry to the maximum yield. Varietal study of tomato conducted by Prasad & Prasad (1977) revealed a lot of variation among the varieties for different characters. They found that Kalyanpur Angocrlata and Kalyanpur types as promising for yield and recommended them for Kanpur condition.
II. Morphology of the Flower characters: — Chakravarty (1949)

While studying the morphology of staminate flower of bottle gourd (Lagenaria leucanta (Duch.) Rusby) considered that cucurbitaceous flowers are pentamercous. In bottle gourd stigma was found to be receptive from 6 hours before to 36 hours before anthesis to 60 hours after anthesis.

In pollen gram aspects: — Section and Cremor (1939)

While studying the influence of climatological factors on the anthesis and anther dehiscence in cultivated cucurbits, found that the temperature was recorded the most important factor while humidity exerted no evident effect. Hays (1955) in cucumber (Citrullus sativus L.) and egg plant (Solanum Melongene L.) observed that the minimum and maximum temperatures govern the anthesis and dehiscence respectively and that humidity or light intensity had no effect. Further Hays (1958) also found that anther dehiscence in cucurbits spp. could be accelerated by the high temperature treatment of the buds for two days or by sitting the other walls at noon of the day preceding anthesis.

Recently, Singh and Singh (1970) recorded anthesis and dehiscence of anther in the evening between 4.30 to 6.15 A.M. during flowering season in bottle gourd. (Lagenaria siceraria).

In the morphological investigations Pascendo (1966) recorded there paves with a reticulate exine and a thick intine while studying the pollen grains of watermelon (Citrullus vulgar schard). In their studies they found that pollen grains from nine varieties, differed only in size, cucumber pollen grains were
longer than those of melon but do not differ structurally from
the latter. Pollen of six species of pumpkin were found
globular, multiporous with a prickly exine (no correlation
was noticed between size of grain and length of prickles.
Pollen grain of three species of water melon had three
meridional furrows and reticulate exine. The viability of
pollen grains of cultivated melon varieties, wild melon
varieties and water melons were maintained even after storage
of weeks, 2-6 weeks and 6 weeks, respectively. Nandpuri and
Singh (1987) observed the shape of pollen grains was about
round and their viability was found to be influenced by
age and temperature.

Sisa (1932) recorded the result of germination tests
of the pollen of varieties of _cucurbita moschata_ poir and
_cucurbita_ pepo showed that in a variety of _cucurbita moschata_
poir. On the day before anthesis the rate of germination
increased from the morning till 9 p.m. and decreased first
showy and then rapidly the next day, in another variety the
decreased did not set until the afternoon. The variety of
_cucurbita pepo_ L. maintained a high germination rate until
the evening.

In the pollination experiments poola and porter
(1933) obtained better pollen germination and faster pollen
tube growth, when the pistillate flowers of _citrus vulgaris_ schild were pollinated, immediately after anthesis.

In the modern era vasil (1960) studied pollen again
germination in certain members of the family _cucurbitaceae_
where he cultured pollen grains of 8 members in artificial nutrient media and observed that among the different culturing media sucrose proved to be the best media for germination of pollen grains.

Awasthi (1969) in *cucumis melo* L. observed highest percentage of pollen germination in 10 per cent sugar with 1 per cent agar. Singh and Singh (1970) in bottle gourd observed that pollen germination was optimum in the 25 per cent sucrose solution. Kishi and Fujishita (1969) observed that fertilization took place after 20-23 hours of self pollination in self compatible species of *cucumis*.

Pengato (1943) studied the diversity of sex-expression in vegetables, Singh (1953) studied three species of trichosanthes for sex and he recorded the variations in sex. Further, he also observed that the maximum number of staminate and pistillate flowers were produced during September and October in early and late sown crops, respectively. Staminate flowers appeared nearly a week before the first pistillate flower emerge in the mousecious species.

Thamburaj and Kamalanathan (1973) reported that in pumpkin (*Cucurbita moschata* poir) and ash gourd (*Beniucasa hispeda* (Thunb.) corgn) staminate flowers used to appear first at lower node no. than the pistillate flower. They also recorded that the node number of first pistillate flower determines the fenates tendency of the crop and staminate flowers were produced more than the pistillate flowers. But in
The germination study *Mehaleb* (*Prunus mahalab*) conducted by Pejkic and Milutinovic (1967) showed that the germination of seeds from clever individual trees ranged from 3.46 to 81.38%. They further reported that there was no correlation of germination percentage with leaf area and stone weight.

Abroskin (1968) reported that by germinating the cucumber (*Citrullus sativus* L.) seeds in the earth's magnetic field with their radicle oriented the south pole and growing the seedlings in the same position increased the proportion of male hemp plants and the number of male flowers. He also recorded that by orienting the radicles first and later the roots towards the increased the number of female plants as well as female flowers.

Roger (1975) stored the common ragweed seeds under natural environmental conditions by placing them at three soil level surfaces, 5 cm and 15 cm in the field and tested the germination at 4 week intervals. He found that the germination was initially greater at high temperature, but the difference in germination decreased with increasing time in the field. Similarly, useful results have been reported in the different trials dealing with certain other crops. (Globerson and Steiner 1970; Roodich, 1971; Bringchley and Wringtous, 1930; Crocker, 1930; Toole and Brown, 1946; Darlington and Stinbaner, 1961; Marrias, 1985; Stelter et al., 1987; Baker and Nigam, 1972; Kew and Menon, 1972; Mohan and Narayanswamy, 1973; Chinnadurai and Ragaswamy, 1973; Srivastava et al., 1972.)
Musilke (1941) observed about 30 to 35 per cent increase in the fruit set of cucumber with hand pollination as compared to natural pollination. In cantaloupe (Cucumis melo L•). Whitaker and prayer (1946) recorded that artificial pollination lead to about 33 per cent more fruit-set which ultimately increase the yield of the crop.

In the pollination studies the observation were recorded by whiltaker (1952) on natural cross pollination in musk melon (Cucumio melo L•) and on the basis of findings he suggested that cross pollination was more frequent in the hills in sheltered locations than in hills in locations exposed to greater wind movement. He also reported that more cross pollination took place in late flowers than in early flowers.

In a preliminary study shah and patel (1966) recorded 31.47 and 17.47 per cent more fruits as a result of artificial pollination than natural pollination in bottle gourd during hot and mansoon weather, respectively. They also found that fruits obtained as a result of artificial pollination in hot and mansoon crop were heavier by 86 and 131 G respectively.

Gollis-George and Hector (1966) in their experiment on germination of seeds of lettuce (Lactuca satina L•) have confirmed that the wetted area of contact was found a factor controlling germination of the seed. Giffs (1967) subjected the seeds of four peach (prunus persica ) varieties namely okinawa namagourd, elberta and loveill to startification by chilling under the condition of florida and showed that seeds from various cultivars differed as to the duration of chilling needed for good germination.
Thamburaj (1973) studied correlation in ribbed gourd (Luffa acutangula L.) and reported that number of seeds per pod, pod weight and pod length were significantly associated with yield. Correlation study in Arhar (Cajanus cajan (L.) Mill sp.) conducted by Veeraswamy et al. (1973) who found a significant and positive association between yield and number of cluster, pod and branches per plant, plant height and days to flower. Singh and Singh (1974) found that fruit yield was positively correlated with number of branches, days to flower, days to maturity, in Chilli (Capsicum annum L.). Genetic studies in ghindi (Abelmoschus eschulentus (L.) Moench.) by Singh et al. (1974) exhibited positive interrelationship of yield with number of flowers, height of plant, branch number, stem diameter and fruits per plant. Observations recorded by Singh and Singh (1974) revealed a significant and positive association of number of pods per plant days to flowering and days to maturity with yield both at genotypic and phenotypic level in Soyabin (Glycine max (L.) Merrill.).

Srivastava and Srivastava (1976) recorded positive association between yield per plant and number of fruits per plant in bitter gourd (Momordica charanta L.) number of fruits per plant was also positively associated with number of lateral branches per plant and number of female flowers per plant.
The findings of Chowdhery et al. (1971) in peas (Pisum Sativum L.) revealed a positive association of yield with number of pods per plant, number of seeds per pods and 100 seed weight. Kohli (1971) while studying the 22 strains of peas (Pisum sativum L.) showed that plant height, pod length, number of seeds and weight of green seeds per plant were positively correlated with yield of green pods.

Similarly, in potato (Solanum tuberosum L.) number of tubers per plant was found to be not correlated with the yield of tubers, however the height of the main shoot and number of leaves per plant was found to be positively and significantly associated with yield and weight of tuber, respectively (Singh, 1971).

The study of correlation between yield and yield components in Phaseolus by Joshi and Mabaria (1973) revealed that genotypic correlation coefficients were higher level in pearl millet (Pennisetum typhoides stapf. and Hobb.). Singh and Singh (1973) reported a significant and positive association of yield with number of internodes and peduncle diameter in Jowar (Sorghum vulgare pers) Srivastava ad Pas (1973) studied the genetic parameters and correlation coefficient in Brassica Campestris L. var. sarson. Prain indicated that genotypic correlations were higher than phenotypic correlations. They also observed a positive and significant association between 1000 seed weight and yield per plant.

Mahadeosaran and Murugasan (1973) recorded positive association between yield and number of productive tillers. Negative and significant association were also existed between 100 grain weight and all other components studied presumably the seed size (100 grain weight) in Ragi.
The study of 36 carrot varieties by Seckarre and Lukomikova (1965) resulted that there was no effect of locality on root form and colour but variation was observed in root weight, time of maturity bolting and content of dry matter, sugars, carotene and ascorbic acid. Davis et al. (1967) recorded character correlation in leaf shape, fruit shape and proportion of flash in the fruit of musk melon (Cucumis melo L.). The observation of Haque et al. (1967) in soyabean revealed that genotypic correlation were slightly higher than the phenotypic correlation. They also found positive and significant association of yield with days to flower, days from flowering to maturity, plant height, pods per plant, nodes per plant, leaves per plant, days to maturity and number of seeds per plant. On the other hand, 100 seed weight was found negatively associated with all the characters under taken in their initiations.

Bahn and Andrus (1969) found that correlation between generation means of fruit characters which responded to selection in mass selected population of the musk melon were usually similar to their correlation with generation number in musk melon. Mital ad Thomas (1969) recorded a significant and positive correlation of the number of branches and pod number with yield in cluster bean (Cyamopsis tetragonoloba (L.) Taub.). Kumar (1970) found in maize (Zea mays) that corneal weight had a direct bearing on yield while kernal number per year and cob weight had a little or no relation with yield. The above findings are supported by Singh (1970) who also reported that in corn ear length, ear girth and seed size may serve as measurable components of yield. In lin seed (Linum listatissium L.) Badwal et al. (1971) observed a positive and significant association of number of pods with yield and plant height.
prasad and prasad (1977) reported high heritability value in to high genetic advance for dry matter content in leaves of radish (Raphanus sativus L·). In another experiment in onion (Allium cepa L·). prasad and prasad (1977) found high heritability along with the highest genetic advance for yield.

Variability studies in a collection of 20 tomato (Lycopersicon esculentum mill.) varieties conducted by prasad and prasad (1977 G) revealed high value of heritability with the highest genetic advance for seed pulp ratio-prasad and prasad (1977 D) found a high value of heritability and genetic advance for flesh thickness correlation coefficient. Genetical studies on the association of yield components threw high on the evolutionary trend and the direction of divergence in association among a group of characters and enable breeders to programme their approach towards higher yield. However, the original concept of correlation was presented by Galten in 1889 which was later elaborated by fisher (1918) and wright (1921) in the experiments of crops data.

Brain (1930) found that the yield was positively correlated with plant height pods per plant and number of seeds per pod in Soyabean (Glycine max L·) merrill. Weetman (1936) while studying the inheritance and correlation of shape size and colour in the water melon (Citrullus vulgaris schard) found a positive correlation between length and weight of fruit. The findings of seaton (1937) showed significant correlation between the weight of the mature fruit and the total number of seeds within each group and this relationship holds on when the three group are considered together in cucumber.