Studies on genetic variability, heritability, correlation and path analysis in strawberry (*Fragaria* x *ananassa* Duch.)

SUMMARY OF THESIS

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The present investigation entitled “studies on genetic variability, heritability, correlation and path analysis in strawberry (*Fragaria x ananassa* Duch.)” was carried out at the Horticulture Research Farm-I of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya Vihar, Rae Bareli Road, Lucknow (Uttar Pradesh), India during 2013-2014 and 2014-2015 with a view to assess the performance of twenty strawberry cultivars namely Sweet Charlie, Winter Dawn, Camarosa, Chandler, Red Coat, Addie, Swiss, IC 319127, Gorella, Jucunda, IC 318915, Sweet Heart, Mecharenj, Fern, Red Ground, Pusa Early Dwarf, IC 319153, CH III- 40, Belruby and IC 318916 under Lucknow conditions. The salient findings of the investigation are summarized below:

1. The present study illustrated the existence of wide range of variations for most of the characters among the strawberry genotypes, which provide opportunities for genetic gain through selection or hybridization.
2. Fruit yield per plant, leaf area index and volume of fruit had high heritability along with high genetic advance. Therefore, further improvement can be done by selection.
3. Fruit yield showed strong positive and significant correlation with most of the characters (height of plant, spread of plant, leaf area index, number of flowers per plant, number of fruits per plant, total soluble solids, reducing sugar, total sugars, fruit length, fruit width, fresh fruit weight, fruit volume and dry fruit weight. Thus, selection may be possible for these characters for improving yield.
4. At phenotypic level, fruit yield showed strong positive and significant correlation with height of plant, spread of plant, leaf area index, number of flowers per plant, number of fruits per plant, total soluble solids, reducing sugar, total sugars, fruit length, fruit width, fresh fruit weight, fruit volume and dry fruit weight. Thus, selection may be possible for these characters for the improvement of the yield of strawberry.
5. Path analysis at genotypic level revealed that the yield is positively correlated with leaf area index (0.117), number of fruits per plant (0.868), titratable acidity (0.543) and fresh fruit weight (0.403). Leaf area index (0.488), number of fruits per plant (0.615), titratable acidity (0.741) and fresh fruit weight (0.449) had also direct positive and significant effect on yield. So, it can be important aspect for improvement programme.
6. Path analysis at phenotypic level showed that the yield is positively correlated with leaf area index (0.728), fruit length (0.853), fruit width (0.763) and fresh fruit

weight (0.373). Leaf area index (0.265), fruit length (0.187), fruit width (0.117) and fresh fruit weight (0.166) had also direct positive and significant effect on yield. So, it can be important aspect for improvement programme.

7. The inter-cluster distance revealed that maximum divergence between cluster I and IV (D^2= 9.022). The intra-cluster distance was ranged from 3.019–5.381. The maximum intra-cluster distance was found in cluster III (D^2=5.381). Divergence provides the greater emphasis for deciding the type of cluster for the purpose of further selection and choice of parents for hybridization
8. Marked variations were recorded in the plant characters like plant height and spread. Cultivars. Plant height was observed maximum in Winter Dawn (10.34 cm) followed by Addie (10.27 cm) and Camarosa (10.20 cm). Winter Dawn was also registered for maximum plant spread (21.57 cm). Since, these plant characters are influenced by environmental factor, thus they were found to be of little use in the cultivar identification.
9. Significant variations were recorded in number of leaves per plant and leaf area index.
10. Strawberry cultivars under study exhibited significant differences in number of flowers per plant and number of fruits per plant. Maximum number of flowers was recorded in Sweet Charlie but more fruits were produced by IC 318916.
11. Fruit size showed marked variations among different cultivars tested during the course of study. Strawberry cultivars exhibited significant differences in their fruit characters such as fruit length and fruit width. The fruits of variety Camarosa were observed to be largest in size (5.37 cm long and 4.15 cm wide).
12. Similar to fruit size, fresh fruit weight was also found in highest in Camarosa (30.39 g) followed by Winter Dawn (28.67 g) and Sweet Charlie (27.26 g). Fruit volume and dry fruit weight were also found highest in cultivar Camarosa
13. Cumulative fruit yield is combined effect of fruit size, weight and number of fruit per plant. The maximum yield was recorded in Sweet Charlie (137. 87 g) followed by Winter Dawn (130.37 g) and Camarosa (125.73 g). The larger fruit size coupled with high yield make these varieties most suitable for cultivation in the region.
14. The contents of total soluble solids in strawberry fruits ranged between 7.48 ^{0}B (IC 318915) to 10.62 ^{0}B (Chandler). The titratable acidity of the fruits ranged from 0.70 per cent (Camarosa) to 0.91 per cent (Red Coat).

15. Significant varietal differences were also noticed in sugar contents of the fruits. The reducing sugar percentage in different cultivars ranged from 3.40 per cent in IC 319153 to 4.47 per cent in Red Coat. Total sugars ranged from 4.47 per cent in IC 318915 to 5.83 per cent in Chandler.
16. Highest ascorbic acid content was observed in Chandler (78.73 mg/100 g) followed by Sweet Charlie (75.07 mg/100 g) and Red Coat (73.20 mg/100 g) whereas, lowest ascorbic acid content was recorded in Addie (64.73 mg/100 g).
17. Fruits of Sweet Charlie, Winter Dawn, Camarosa and Chandler were most preferred by the sensory panels.

Consequently, the present investigation illustrated the existence of wide ranges of variations for most of the characters among the strawberry genotypes, which provides opportunities for genetic gain through selection or hybridization. The significant positive correlation of yield contributing traits viz. height of plant, spread of plant, leaf area index, number of flowers per plant, number of fruits per plant, total soluble solids, reducing sugar, total sugars, fruit length, fruit width, fresh fruit weight, fruit volume and dry fruit weight towards total yield per plant indicated that these traits can be used as reliable parameters in selecting genotypes for developing high yielding varieties. The positive correlation of yield with various characters exhibited that the characters contributed more yield. Therefore, selection on the basis of these characters will be more effective. The minimum inter and intra-cluster distances indicate the close genetic relationship among the accessions of two clusters and within the clusters. Accessions among the cluster separated by high D^2 values could be used in hybridization programme for obtaining wide spectrum of variations among the segregates. Accordingly, 20 strawberry cultivars were tested in the present investigation, out of which, Sweet Charlie, Winter Dawn, Camarosa and Chandler were found to be promising under agro-climatic condition of Lucknow. The results of the study clearly indicated that the strawberry cultivation of Sweet Charlie followed by Winter Dawn, Camarosa and Chandler can be a remunerative enterprise for the farmers of the region which showed high yield potential as well as superior fruit quality. On the basis of sensory evaluation (Organoleptic test) these four cultivars (Sweet Charlie, Winter Dawn, Camarosa and Chandler) were scored highest for sensory characters i.e.. skin colour, flavor, taste, texture and juiciness, respectively.