

Chapter-6

Summary & Conclusion

6. Summary and conclusions

Among the five cultivated species of the genus *Capsicum*, *C. annuum* is most commonly cultivated either for pungent fruited genotype called chilli (synonyms: hot pepper, American pepper, chile, azi, cayenne, paprika etc.) or non-pungent fruited genotype called sweet pepper (synonyms: capsicum, paprika, bell pepper, Shimla mirch). Based on fruit size, shape and degree of pungency, a large number of horticultural types are recognized worldwide and at least 20 types are largely cultivated at large scale in one and other parts of the world. The breeding objectives for quality traits of hot pepper and sweet pepper could be described on the basis of five market types. Among the various market types grown in India, landraces of paprika type chilli (non-pungent fruits with high oleoresin contents) is being presently cultivated at limited scale in Karnataka and Andhra Pradesh, although there is a great potential of export of natural colouring agents in the international markets. Considering the limited work done on the development of improved chilli varieties/hybrids for paprika production, as a part of long term paprika breeding programme at Indian Institute of Vegetable Research (IIVR), this investigation was undertaken with four major objectives and objective wise results are summarized and discussed in the following text.

Objective (I). To screen chilli (hot pepper) and sweet pepper germplasm lines including improved populations, inbred, gms and cms lines for capsaicin and oleoresin contents and identification of populations with low pungency and high colour value (low capsaicin and high oleoresin contents).

The results of this investigation clearly revealed that beside genotype dependent, the expression of pungency is also highly influenced by the environmental factors. PBC-535, a pungent Indonesian landrace, was found to be non-pungent during this study and the expression of pungency was stable. The comparison of two season's data on oleoresin contents of a given genotype revealed that over the season there was not much difference in the oleoresin contents, indicating that expression of colour is more stable than the pungency. PBC-535 also had average of 15.0% oleoresin (249.28 ASTA colour) with less (0.20%) capsaicin. Hence among all the genotypes analyzed, PBC-535 may be considered most potential paprika line with less pungent fruits (less capsaicin) and high colour (high extractable colour). As this line is well adopted in India, it should be used in breeding programme aiming to develop chilli cultivars suitable for oleoresin extraction.

The pungency level of BS-35 (over two seasons) was found to be comparable with the world's well recognized hottest pepper i.e. Habanero (200000 SHU). But the pungency of BS-35 was lesser than the Tezpur Chilli (855000), which is now considered as the world's most pungent (hottest) pepper. Both Tezpur Chilli and BS-35 are the landraces grown in North East Indian states and provided evidence that very pungent landraces exist in the recognized secondary center of diversity i.e. India.

Objective (II). To develop and evaluate chilli hybrids and inbred lines with respect to yield, capsaicin and oleoresin contents.

The fruits of all parents (10 male and a CMS) and crosses (10) were analyzed. The minimum capsaicin (desirable for oleoresin extraction) was found in the cross CCA-4261 x Byadagi Kaddi (0.16%) followed by CCA-4261

x Byadagi Dabbi (0.18%). Both these crosses had 281.26 and 314.88 ASTA colour. Hence, it would be worth to re-evaluate both these crosses to test their potential for oleoresin extraction or for other market types.

The capsaicin analyses of inbred lines derived from different genotypes showed that the expression of capsaicin is more stable in the inbred lines than their original population. For example, inbred derived from PBC-535 had 0.03% capsaicin and average capsaicin in its population was 0.20%. Similarly, the inbred lines derived from Byadagi variants also had desirable level (less) of capsaicin i.e. Byadagi Dabbi (0.07%) and Byadagi Kaddi (0.09%). Hence based on the aforesaid discussed results, it is suggested to develop improved cultivars suitable for oleoresin extraction (very less pungent fruits with high colour) through pure line/pedigree selection or heterosis breeding instead of population improvement programme.

Objective (III). To develop and evaluate cms based hybrids for fertility restoration and assign restorer and maintainer genes to the inbred lines.

A total of 78 hot and 17 sweet pepper lines were screened for the presence of fertility restorer (*Rf*)/maintainer (*rf*) genes. All the hot pepper lines had *Rf* genes, while most of the sweet pepper lines had *rf* gene. Some of the inbred lines screened during this investigation were also examined previously and the results are consistent except for few cases. For example, in previous study, two generations selfed inbreds of JCA-9, LCA-206, ISPN2-3, PDC-49A and G-5 were found to be segregating for the *Rf/rf* gene (Kumar *et al.*, 2006b), however, in this investigation inbred derived from these lines were not segregating and possess only *Rf* gene. This is because in this study fourth generation inbreds were used and *rf* gene might have lost in the selfing

process. These kinds of results clearly suggest that maintaining chilli germplasm through selfing is not desirable rather it would be wise to maintain the population through sibing. The newly characterized restorer and maintainer inbreds will be useful in cms based heterosis breeding.

The results on fertility restoration of F_1 derived from common male parents and CMS female parents (derived from two independently isolated cytoplasms), revealed restorer (KA-2) of Peterson cytoplasm (CCA-4261), enable to restore male sterile cytoplasm isolated in India. However, Punjab Lal and SP-106 restored fertility in both the cytoplasms. These results could partially be explained on the basis of possible genetic differences between the two independently isolated cytoplasms coupled with genotypic differences of utilized male parents at fertility restoration (*Rf*) locus.

Objective (IV). To evaluate chilli germplasm for selected nutritional quality, especially ascorbic acid in order to suggest future quality breeding objectives.

Red ripe fruits of a total of 105 germplasm lines were analyzed for ascorbic acid contents and lines with high ascorbic acid contents have been identified. Eleven genotypes were selected for ascorbic acid estimation from green and red ripe fruits. The results revealed that the ascorbic acid contents increases as the fruits mature. However, the results also showed that certain genotypes like 92-1206 and IC-119321 expressed high amount of ascorbic acid in the green fruits and could be considered as potential lines for developing chilli varieties/hybrids containing more amount of ascorbic acid in green fruits.

