Genetic breeding and selection of mangoes in pakistan

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The mango (Mangifera Indica) belongs to the family Anacardiaceane whose 40 species are found in South Asia and 13 of them cultivated for edible fruits. The mangifera Indica varieties in Sindh are: Sindhri, Beganpali, Swarnarika, Neelum, Desahri, Langra, Alphonso, Siroli, and Chaunsa. Due to genetic erosion and biological diversity is important to conserve the germplasm and improved rootstocks of mangoes and improve these varieties further, by having desirable characters by genetic principles which help in plant breeding, breeding for disease resistance, breeding for quality trials and mutation breeding. There are mangoes which are self sterile and these could easily be used for crossing with various varieties of good characteristics. Plant breeding process reuiqre considering various factors e.g physiological (biomass, leaf area, specific leaf colour and weight) and morphological characters e.g., (flowering pattenr, number of mature seed, vegetative growth which directly or indirectly have influence on yield.

Mango varieties problems are; alternate bearing, lack of colour, presence of fibre, poor shelf life, Jelly seed, poor pulp ratio, fungal diseases and poor yield. Mango trade has limitations due to its highly perishable nature, susceptibility to diseases, extreme of temperature in producing countries, easy physical and mechanical injuries of the furit after harvest.

Genetic breeding is a slow process as development of each individual variety and property takes very long time and to trace out the heritability of individual characters is time consuming and costly. The researcher needs to study the morphology of flowers, time of anthesis, dehiscience of anthers, pollen morphology, receptivity of stigma and fruit setting etc., to collect data required for breeding program. The pollen fertility is checked by the degree and duration of temperatures, and stress during transition period causing flowering and fruiting.

Breeding objectives are: to develop superior cultivars, better fruit production, regular bearing, dwarf plants high production per tree, more trees per acre and thereby more yield per unit acre, better shelf-life and resistance to pests and diseases. Breeding methods are used to develop a new cultivars which retain the characteristic flavour, improved productivity, greater disease resistance, enhanced skin colour and better post-harvest performance. The breeding criteria also would involve producing fruit of large size, large pulp percentage as compared to skin and stone, good sugar-acid blend, pleasing aroma, long shelf-life, very and very late maturity to extend season to 6 months, free down from spongy tissue and suitability for fresh fruit as well as for canning.

Although lot of work has been done to study physiology and biochemistry of mango fruit development, but many processes like fruit ripening, change in colour, flavour, texture, aroma, sugar to acid ratio and seed development are not fully understood. Ripening of mango is a biochemical reaction which occurs in fruits with help of many enzymes like sucrose, phosphate syntheses, a clase, peroxides, polygalacturonase and ethylene synthesis enzymes activities by isolation of ripening genes. Estimates for the genetic variance component were obtained though linear model and regression analysis between parent and progeny performance and estimates of genetic correlation between several traits are based on performance of the parents and their progeny. Several mango cultivars have been regenerated by somatic embryogenesis from nuclear cultures.

Genetic manipulation of mango with proper genes is used to understand various development processes and production of fruits with desirable traits and study the genes which cause ripening and improvement is shelf-life for mango marketing. The scientists are working on the isolation of ripening specific genes, coding for different types of enzymes and their role during fruit ripening and the process of fruit size. These are governed by additive genes. The duplicate gene is mango is responsible for its red skin colour. The dwarfness and regular bearing is controlled by recessive genes, while regular bearing have close linkage with precocity in breeding.

The use of genetic markers to improve mango cultivars is used in genetic breeding. RAPD molecular markers are also used to determine phylogentic relationships among various mango species but RAPD generated clusters did not always agree with the taxonomic classification based on phenotypic traits. While molecular markers are used to study phylogenetic relationship in many diverse taxa, two kinds of DNA markers, DNA Fingerprints and AFLP are one used as a tool for identification of cultivars and improvement of mango breeding. The cultivar breeding program the application of DNA fingerprints to mango enables the identification of various cultivars and rootstocks. Antisense technology is used to understand function of genes, involved in ethylene production which governs many fruit growth processes.

Future Research.

The Mangifera germplasm consist of two groups: (a) the wild species (b) the cultivated varieties mainly being to Mangifera Indica L, and also other forms of Mangifera Odorata, Mangifera foetida, mangifera caesia and Mangifera pajang cultivated in South-East Asia. For future genetic improvement we need in-situ and ex-situ conservation of the germplams in mango. We also need catalogucing the available gemrplams.

The selection of mangoes with desire character is necessary, as it helps in removing inferior types and those prone to physiological disorder and select those varieties having greater market appeal and better cost benefits ratio. Plant science and biotechnology can improve mangoes production in various ways like:

- Making planting material available.
- Use of improved nursery practice.
- Development of new varieties (cultivars).
- Breeding of new trials.
- Improvement of growth rate and yield.
- Management of root-stocks.

We need rich genepool and adequate practical measures which must be rapidly implemented to ensure the long term survival of mango genetic resources. The selection and breeding practice depend upon:

- Regular cropping with good yield under favourable condition.
- Developed dwarf plants.
- Time of maturity extension of ripening season.
- Attractive skin colour.
- Fruit quality, taste, nutritional value.
- Mango rootstocks with tolerance to saline condition.
- Pest and disease susceptibility.
- Precocious bearing.
- Better harvesting methods.

- Tree growth and habit given more leaf to wood ratio.
- Regular bearing.
- Reduced amount of exuded sap.

Tissue culture and somacoloning could provide both rapid propagation of colons, plus an area for possible mutation manipulation particularly for selecting disease resistance. Cultivars propagated stone grafting, veneer grafting and inarching grow faster than those propagated by stooling and air layering.

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