

The Leaf, Flower and Fruit Characters of the Santra Orange.

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DURING the course of several years of work on the Die-back disease of citrus trees in the Bombay Presidency, the writer had opportunities to study the Santra* orange tree in detail. The following observations may be of some interest:—

The leaves of Santra are unifoliolate, glabrous, elliptic and acuminate, with a lighter colour on the lower surface than on the upper one. They are leathery in texture and have entire or very slightly serrated margin. Their average length is 6.7 cms. and the average maximum breadth 3.4 cms. The average leaf factor is 2. They contain a large number of small round oil glands. If crushed, they give out a mild and somewhat agreeable characteristic aroma. The petioles are naked, and the wings are very narrow if present. The leaves are alternate or spiral with three to five leaves in a spire.

Internally the leaves are seen to contain a large number of cystoliths of Calcium oxalate. They are larger in size and more in number in the leaves of trees grown in limy soils. Examining sections of leaves of Santra plants grown in the *shadu* soil which contains over 15% of lime, as well as of those grown in compost containing only 0.3% of lime (CaCO₃), it was noticed that the cystoliths were larger and eleven in number in the former, and smaller and only nine in number in the latter, in a uniform length of 800 μ . On the basis of this indication, both the leaves were analysed and it was found that, on dry matter, leaves from compost contained 7.15% of Calcium oxalate, whereas those from *shadu* soil contained 8.11 per cent. These figures, substantiated by other analytical figures, are interpreted to lead to the conclusion that (1) the orange trees are partial to calcium salts as they gather a large percentage of them (7.15%) even from a proportionately calcium-poor (0.3%) soil, and (2) there is a limit to such absorption as not more than 8.11% is taken in from a highly Calcium-rich (15%) soil.

The flowers of Santra are small, white and very sweet scented. They may be solitary in the axils of well-developed leaves or in small racemes. They are bisexual. Sepals are 5, petals are also 5 and free. Very rarely only four petals are found when one of them is bigger than the others and has a small at its apex. Thus it indicates a double petal. The stamens are sixteen to twenty, the filaments are long or short, variously connate, and compressed at the base. Usually two sets of connate filaments are found—one large with ten to sixteen filaments, and the other small with two to eight filaments. The anthers open after the flower opens. The style is short, medium, or long. When it is short, the stigma is almost close to the ovary, the flower is also smaller than usual, and it drops without setting fruit. When it is medium it is a little more than half the length of the stamens,

and in such cases, the fruit may or may not set. The completely developed flower has a long style and the stigma is always in level with the anthers. The stigma comes into receptive condition some time before the flower opens and the anthers are ripe. The ovary is many-celled. The flowers generally open in the evenings and take several hours before they are wide open. The outermost petal opens before the others. To start with a small slit is seen at the apex of a fully developed flower bud; then it takes at least an hour before the free petal opens; then the others follow. Cool breezes hasten the opening of the flowers. The petals and the stamens drop soon after the pollination, but the style persists for some days until the ovary becomes deep green and well established.

The fruit of Santra is deep orange coloured when properly ripe. The rind is smooth and thin. It shrivels and presents prominent folds, when the fruit is kept for some days after harvesting. The cavity is generally absent. When present, it is narrow and small. There may be sometimes a small necklike projection of wavy rind near the stalk. The stalk is medium in thickness. The basin is shallow, broad and round. The size of the fruit is medium, the main axis measuring 7.8 cms., and the maximum diameter, 8.9 cms. The form of the fruit is round and oblate. The rind is full of small pits, with thickly placed oil glands. In ripe fruits, the rind is very thin, being only 2.3 mms. in thickness. When the fruit is ripe, the segments become loose and detached from the rind, with a white woolly material loosely occupying the interspace. In all stages of the development of the fruit, the rind is easily separable from the segments, except during the first two or three months. The number of segments in the fruit varies from 8 to 13. The segments are enclosed in a membranous cover, which can be easily removed. They form the septa in the fruit which separates the different segments from one another. The core is open with a fairly big hollow, when the fruit is ripe, with the wool thinly placed in fine fibres which are attached crosswise to the walls. The pulp is bright orange in colour. It is very juicy. The juice is delicious, being sweet and well blended with sourness. The small juice sacs are spindle or needle shaped, with their base attached to the septa by thin delicate stalks. The juice sacs melt easily in the mouth and leave practically no rag. The seeds are about twenty per fruit and are irregularly distributed in the different segments. They are also medium in size, and mostly egg-shaped.

The Santra fruit takes about ten months for complete development from the time of flowering. The development of the fruit at various stages shows that in the first few months, the fruit is hard, with its rind closely adhering to the segments inside. The pulp is very acid and becomes more and more juicy after the fourth month. The skin becomes gradually loose from this period. The colour of the fruit begins to change from deep green to yellow and then to orange from the eighth month.

*Santra is *Citrus nobilis*, variety *deliciosa* (Cheema, G. S. and Bhat, S. S., "A study of the citrus varieties of the Bombay Presidency," *Current Science*, February 1934.