Domesticating Anti-Lepric Species in Brasil

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PART II.

The Monoclinous flowers (see Fig. 6) are inconspicuous but more lasting than the staminate ones; remaining fully opened for three or four days before casting their floral envelope or falling off. They are somewhat difficult to detect.

Repeatedly trees have been inspected and given a non-flowering check, but later were found to be bearing fruit.

Our Centennial Tree is monoclinous; the first year it bloomed, 1929, a generous lot of flowers were produced but no fruit set. Although the main orchard producing staminate flowers in abundance is less than 300 meters away. The second year of blooming we hung in it small staminate branches, placed in vials with water. Result was a generous setting of fruit in that quarter of the tree. Every morning

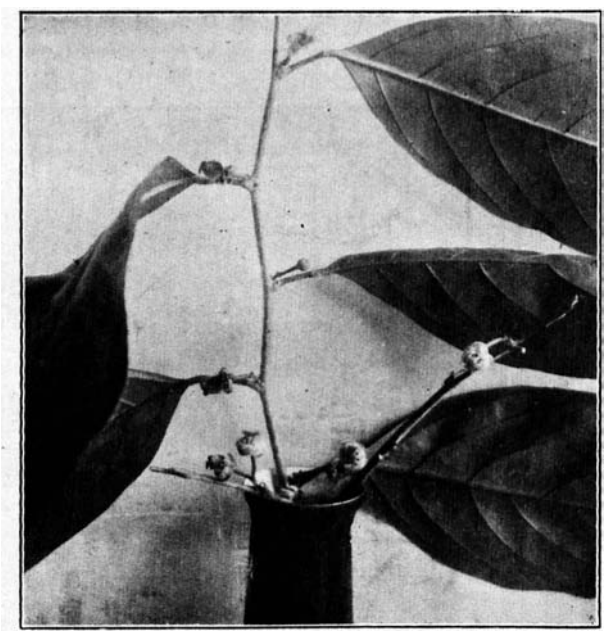

FIG. 6. Monoclinous Flowers. Occur singly, on new shoots and terminal branchlets. The four flowers nearest vase fully opened, showing pistils, stamens, petals and sepals.

new staminate flowers opened. These attracted smaller insects, which later visited the monoclinous flowers. A check on the insect behaviour showed nine out of thirteen visited the staminate flowers first. Small hymenoptera, including the honey bees and large ants, were the most frequent visitors. The behaviour of the ants was interesting; if they ran up a branch, other than the one to which the staminate blooms were attached, they back-tracked and tried again. Later they would search out the sprigs bearing the monoclinous flowers. In 1937 this tree set one fruit without artificial aid. (Dec. 5, 1937, while working on this article a humming bird visited the " bouquet " of monoclinous flowers in an open window only two meters away.)

On Tree V:5 it took from 19 to 21 months from the opening of the flower until the dropping of the fruit. During which time the second crop of 57 new fruits had set.

THE NURSERY.

Fruit dropping occurs in winter (June, July, and August). The seed need to be carefully conserved; neither too dry nor too wet. (See Seedbed under Sapucainha in Part I. Also Araujo, Luiz Carvalho.)

Sow seed in spring, allowing 20 cms. each way between seed; when well conserved they have a high percentage of germination. Provide complete shade, removing gradually

FIG. 7. The Chaulmoogra Seedbed is a joy to the nurserymen; Aug., 1937, about six months sown, more than two thousand in the College seedbeds; 10 x 10 cms., 90% germination; 80% sufficiently aclimated to justify planting to the nursery.

until the seedlings are 40 to 50 cms. high. At germination the seedlings are sensitive to direct sunlight. A Chaulmoogra seedbed is a joy (see Fig. 7) to the nurserymen while the seedbed of Sapucainha is his despair.

Nursery Row. When the seedlings have attained a height of 40 cms. and are well " hardened off," they transplant to the nursery as easily as do citrus seedlings. The College has a thousand or more trees in the nursery and some hundreds of seedlings planted to an orchard.

BUDDING.

The experiments show that the " T "-bud method is successful and makes a robust tree. (See Fig. 8). The location on the stock and choice of buds follows closely that discussed under Sapucainha. Our stock was limited to the staminate trees that had bloomed. The monoclinous trees and the " unknowns " were regarded as too valuable to be

used for budding or grafting experiments. Tree V:5, carrying a crop of fruit, was our only source of budwood.

PRODUCTIVENESS.

Tree V:5 ripened the first crop of four fruits in 1931, five years after planting, and has been a constant but variable cropper. In 1932, the second crop consisted of 57 fruits. The seed were sent to Dr. G. S. Jamieson for chemical analyses. He informed us that the per cent. of oil was the

FIG. 8. Budded Chaulmoogra. Tree IV: 5. Budded Sept. 13, 1930, on S.P.I. No. 56,633 stock Bud from Tree V:5, of the same importation. Four meters tall and five spread. Doubtless the oldest and largest budded Chaulmoogra in the Americas. (Junior author at left). Photo. Dec., 1936.

same as that in the seed from Burma and that the quality of the oil was equal to the best.

Likewise the daughter bud IV:5 (see Fig. 8) has been a regular but moderate cropper. Tree A:1 in 1937 set such a heavy crop that its top broke out in September when the fruits were less than half grown, losing over a hundred fruits. During the same month the top broke out of tree A:14 and one of the larger limbs split from the weight of fruit. The majority of the trees have so far been light to "shy" bearers. However, our orchard is very young; only eleven years old; precocity and productivity may not be linked qualities. The relatively small number of monoclinous trees does not justify making quantitative generalizations.

The discovery that the Chaulmoogra is productive with us without artificial pollenization is important.

RESUME

1. The climate in the highlands of Minas Geraes is such that these afford a suitable habitat for the Chaulmoogra. (Our orchard passed a temperature of minus four-tenths of a degree Centigrade without showing injury.)

2. Our seeds produce a quality and quantity (per cent.) of oil equal to that of the seed grown in Burma.

3. Asexual propagation (3) is easier than in the case of the avocado and produces a vigorous tree. (See Fig. 8.)

4. The monoclinous flowers, while doubtless self sterile, are abundantly productive in the presence of staminate trees (even over-productive as in the cases of Trees A :1 and A :14 in 1937).

FIG. 9. Interior Fruiting Branchlet. Nov., 1937. Fruit, diameter 8 cms.; a year old; still 6 mos. to ripening, from Tree A :12, one of the best croppers. In Sept., 1937, the top broke out and a larger limb split from weight of fruit. Most of the crop is borne on interior branchlets.

THE GORLI BUSH

(ONCOBA ECHINATA, OLV.)

At the same time that Dr. K. A. Ryerson presented the " Escola " with the Chaulmoogra seedlings, he gave us 40 seedlings of the Gorli Bush, S.P.I. No. 55,465. These averaged about 25 cms. high and were planted in a nursery to

attain size and robustness suitable for setting out to an orchard. During May, 1926, some 20 or 25 were judged to be in condition to justify planting out; of these 19 were living in December, 1937. The other 21 died out, one after another, without being visibly affected by insect or diseases. The nineteen living ones ranged in height from $1\frac{1}{2}$ to $2\frac{1}{2}$ meters and of varying diameters (3).

FIG. 10. Crown Shoot of Gorli Bush. O:14 is the heaviest fruiter; this shoot, one of twenty, carried 83 fruits, Dec. 3 1937.

In October, 1929, the first flowers were recorded; none of which set fruit. In August, 1930, fifteen bushes bloomed; nine set fruit.—Four years from planting.

Productiveness. In production they vary greatly; some being quite unfruitful; a majority bearing a small crop. Only one, O:14 being a heavy producer. It was one of the first nine to come into bearing and has always borne the heaviest

crop. In 1937 it ripened as much or more than the other 18 combined; as it had done in some previous years. This year (1937), it ripened a thousand six hundred fruits. An average sized one weighing 170 gms. (see Fig 1) and yielded 141 seeds weighing ten and one-tenth gms. About a kilo six hundred gms. for the bush. (See Figs. 1 and 2.) One of the largest fruits yielded 15 gms. of air dried seed. It takes from six to nine months from the time of blooming to ripening, when the fruits turn a golden yellow. They remain on the bush for some weeks, splitting open and dropping the seed; often the fruits turn brown and the seeds become quite air dry.

Propagation. Our Chief Chemist, Dr. Guilherme Emmerich, who had an abundance of fruit from our antilepric orchards, informed us that the Gorli was less desirable than the other two, so our interests in progagation were centered on those two species.

The late Dr. Areene Puttemans rooted cuttings, showing that this method of asexual reproduction may be employed. The rooting of ripened shoots would appear to be a very promising method for reproducing these plants.

The seeds germinate readily, which suggests that propagating from the best bushes for a number of generations would be practically certain to lead to the development of a productive strain. Requiring, however, much time and patience.

The growth of the Gorli Bush is mainly from vigorous sprouts arising at the crown. This rather invalidates budding; since it would require a great deal of expert labour to prune out the sprouts arising from below the bud. Root grafting might be the solution.

Unless new conditions arise, our time and energy might be expended to greater advantage on some other species.

CONCLUSIONS.

1. Domestication is imperative to secure uniform crops of high quality.
2. An orchard of seedling trees is productive but lacks uniformity and productiveness.
3. Our investigations have demonstrated that budding of the Sapucainha and Chaulmoogra is feasible.
4. The Sapucainha is the more precocious and productive.

ADDENDA.

Dr. J. B. Griffing, wishing to be of as great service as possible to those engaged in this meritorious work, has kindly permitted us to make the following announcement:—

That the "Escola Superior de Agricultura" will attempt to supply a half kilo of seed (500), gratis; from trees budded to variety E.S.A.V. No. 1; to such

institutions as wish to propagate the Sapucainha. Those institutions that can maintain an orchard of fifty to an hundred Sapucainha trees will find this amiable gesture very helpful.

Requests for seed should be made to Dr. J. B. Griffing, Director, E.S.A.V., Viçosa, (State of) Minas Geraes, Brasil.

REFERENCES.

(1) KUHLMANN, J. GERALDO, Monographia das Especies Brasileiras dos Generos da Tribu Oncobeae: Carpotroche, Mayna e Lindackeria, (Flacourtiaceaes) Cujas Sementes Contêm um Oleo Analago ao Obtido das Sementes da Chaulmoogra. *Mem. do Inst. Oswaldo Cruz,* XXI :389-415, Rio de Janeiro, 1928.

(2) ROLFS, P. H., A Chaulmoogra, Onde e Como de Deve Plantal-a. *A Lavoura,* XXVIII :93, No. 3, March, 1924. Rio de Janeiro. Revista da Sociedade Nacional de Agricultura.

(3) ROLFS, P. H., and ROLFS, C., Aclimaçao e Domesticaçao das Especies Antilepricas, *A Lavoura,* XXXV :238-249, No. 7, 8, 9; July-Aug.-Sept., 1931. Rio de Janeiro.

(4) ROLFS, P. H., and ROLFS, C., A Cultura da Sapucainha, *Bol. Agricultura, Zootechnia e Veterinaria.* Ano IV, No. 10-12: 5-29, 1931, Bello Horizonte.

(5) ROLFS, P. H., and ROLFS, C., A Muda de Citrus. 126 pp., 37 ills., Sec. Agrl., Viaçao e Obras Publicas, Bello Horizonte, Minas Geraes, 1931.

(6) ARAUJO, LUIZ CARVALHO, Cultura da Chalmugra (Chaulmoogra), *Bol. de Agrl., Zootech. e Vet.,* VII :93-96. Secr. da Agrl., Viaçao e Obras Publicas, Bello Horizonte, 1934.