

### SEX REVERSAL (HETEROGAMY) IN THE JACK-FRUIT TREE, (*ARTOCARPUS INTEGRIFOLIA*, LINN.)

THE flowers of the jack-fruit tree (*Artocarpus integrifolia*, Linn.) are usually monoecious, on uni-sexual, axillary pedunculate receptacles. An abnormal inflorescence was noticed in a tree in Bangalore in September 1947. On the male receptacle, with the male flowers extending over a length of about two and a half inches, the female flowers developed on a side at the base for a distance of 0.8 inch in the linear axis, and 0.9 inch across (Fig. 2). Later in September 1948, the same tree bore on a branch, on the fourth receptacle from the tip a similar abnormal inflorescence (Fig. 1).

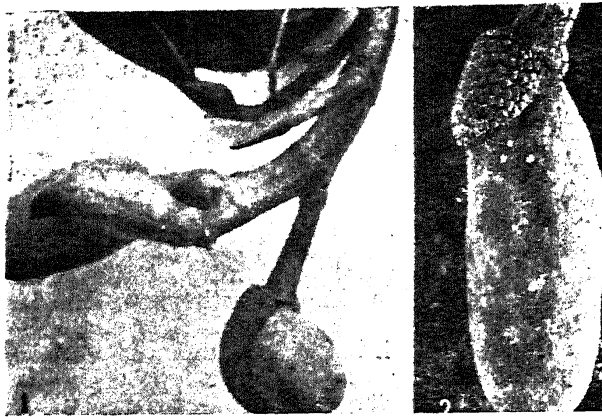


FIG. 1

The female flowers had pushed the male receptacle to a side by their growth. The male axis was about three inches long, by an inch and a half thick, while the female axis was also three inches long, and nearly two inches across. This kind of a change in the arrangement of the male and female flowers is known as heterogamy.

Instances of reversal in arrangement of flowers or the sexual organs have been observed. According to Masters<sup>1</sup> and several others in the cultivated maize, now and then one finds examples in which the sexes are mixed in one and the same inflorescence, the tassels which usually contain only male flowers sometimes bear female flowers (tassel seed). In the same manner but more rarely, the female inflorescences occasionally bear the male flowers (anther ear). Masters<sup>1</sup> states that in hops (*Humulus lupulus*) and *Urtica dioica*, the usually dioecious condition is sometimes changed into a monoecious condition with the female catkins at the end of the branch, and the male catkins below. Frank<sup>2</sup> has observed that in *Salix babylonica*, the weeping willow, there is a transformation of the stamens into pistils, and the pistils into stamens. A similar transformation has been observed by Cecil Yampolsky in *Mercurialis annua* (Robbins and Pearson<sup>3</sup>). Frank<sup>2</sup> states that in *Cirpivus betulus*, some stamens occur in the female flowers. According to Robbins and Pearson,<sup>3</sup> the late Prof. Rosa found in some strains of

spinach, "a considerable portion of the plants, purely pistillate in the early part of their flowering period, produce, later in the season, some staminate flowers towards the tip of the branches, especially of small lateral branches." Robbins and Pearson state that Cecil Yampolsky obtained in male plants of *Mercurialis annua*, stray female flowers some of which bore seeds, and the seeds produced all males.

These different sex conditions are supposed to be caused by factors definitely known to be located in the chromosomes. Some of these are known to produce, in maize, partial or total sterility or to modify the expression of either the staminate or the pistillate inflorescence or both.

The sexual forms of flowers have been found to vary with the changing conditions, within and around the plant, and often with the time of the year. Robbins and Pearson<sup>3</sup> report an interesting case of change in physiological conditions causing a change in sex of flowers in the Hawaiian Islands, "where some one cut off a male papaya tree, and the new shoots which came up from the stump were all female!" Schaffner<sup>4</sup> succeeded in obtaining sweet corn plants whose tassels showed reversal to the pistillate condition by shortening the length of day; the ratio of sex reversal was inversely proportional to the length of the daylight. Little or no reversal occurred with equal day and night periods. He concluded that the sex-reversal might be independent of any sex-determining factors. It is well known, however, that genetic factors do come into play, but that they may be influenced by the environment.

Some fungi are known to cause the development of dormant or rudimentary structures and to induce the growth of entirely new organs. According to Butler,<sup>5</sup> stamens that normally are rudimentary in the pistillate flowers of *Lychnis* (*Melandrium*) *dioica*, when attacked by anther smut (*Ustilago violacea*) in Europe, grow to full size, but only produce smut spores instead of the pollen grains, and buffalo grass (*Buchloe dactyloides*) may form ovaries in its staminate flowers when parasitized by the smut fungus, *Tilletia buchloana* in America.

According to Baker<sup>6</sup> recent observations by Love, A., and Love, D., have shown that the development of stamens in pistillate plants of *Lychnis* (*Melandrium*) may be brought about by treatment of plants with the animal hormone testosterone, while the reverse change has been caused by oestrone. Baker notes that when such change occurs some secondary sexual characters also develop, but other characters persist, because they are sex-linked. Infection by the smut or the application of testosterone can promote the formation of stamens, and suppress the formation of pistils.

*Rhizopus artocarpi* is a common fungus on the male inflorescences of the jack-tree, but the infected receptacles soon drop down. Apparently this infection cannot bring about the sex-reversal. The abnormal inflorescence was noticed to be infested with some mealy bugs, though not in large numbers (Fig. 2). The tree was subject to frequent cutting off