

A NOTE ON THE DROPPING OF FLOWERS IN THE POTATO¹

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THERE is considerable popular interest in the failure of many potato varieties grown today to set seed. The varieties of our forefathers are generally supposed to have set seed-balls in abundance. It has been generally held that the cooler northern States such as Minnesota furnish conditions favorable to the development of seed-balls, but recently Newman and Leonian report seed-ball production in the Lookout Mountain variety (when grown as far south as Georgia) that certainly equals seed production farther north at its best. In fact these investigators are attempting to develop varieties which will produce by seed as well as by tubers. An occasional year when seed-balls are more abundant than others is well known, but the interest of growers centers more around those years when the flowers are abundant, but seed-balls rare, if any develop. The disposition of the flowers in the last case is the theme of this article.

It should be stated that flower production varies from year to year and also that some varieties habitually bear fewer flowers than others. For instance, King seldom produces flowers, while Green Mountain bears them in abundance. It follows then that seed-ball production must also vary from year to year and between varieties. Some contend that seedlings bear more seed-balls than the older varieties.

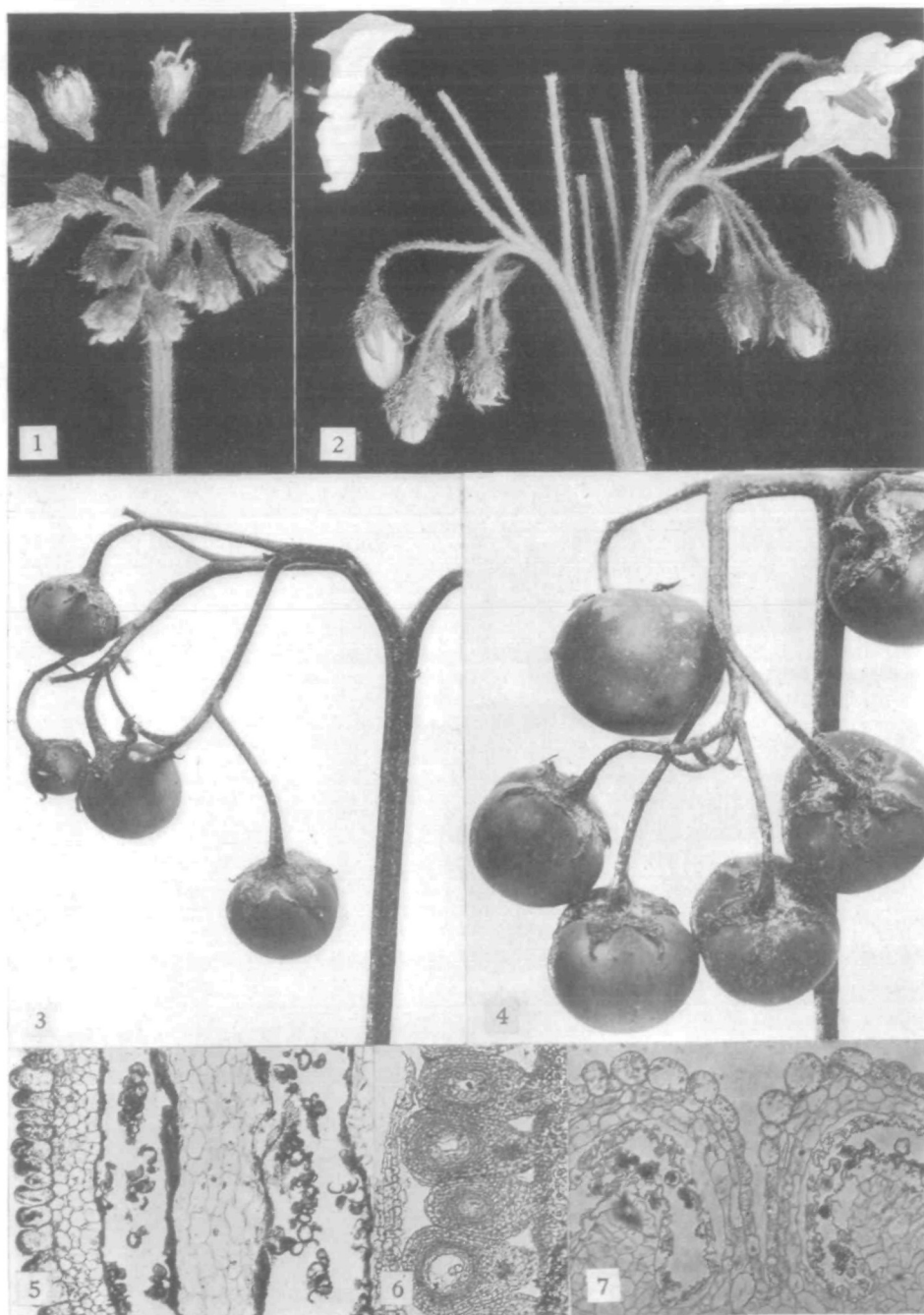
Early Ohio (Fig. 19, Nos. 1 and 2) and Rural New Yorker bore flowers in abundance at the Fruit Breeding Farm in 1918; but, like so many other seas-

ons, all fell off so that at harvest time not a single seed-ball could be found in the entire patch. What happened? An examination of the blossoms when the first flowers were open showed that both the opened flowers and buds were falling in large numbers. In some clusters there was a partial succession of bloom, but the first flowers to open fell as the later ones came into bloom. In others the younger as well as older buds were falling several days in advance of the time they were due to open. In still others the younger buds fell before those which had come into full bloom. It is unusual to find dropping taking place simultaneously in flowers differing so much in age, because in most cases flowers normally fall after maturity.

The joint in the pedicel (Fig. 19, No. 1) at which the flowers drop is three to five millimeters below the flower. There is a conspicuous swelling in the pedicel at this point, and before the flowers fall the stem is noticeably yellow in the younger buds as well as those which have opened. Buds or flowers sometimes drop on clusters in which seed-balls have already developed, and rarely even the younger seed-balls may drop. There is no abscission layer subtending the flower stalk, and after the flowers have all fallen off it persists and, in the absence of leaves at the base, dries up and can be found in this condition at maturity.

In many of the varieties a large percentage of the pollen is defective and in some no normal pollen is produced (Fig. 19, Nos. 5 and 7). Counts in a

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(1) Early Ohio, flowers dropping before opening; (2) Early Ohio, flowers dropping after opening; (3) seed-balls setting on a cross between Keeper and Silverskin; (4) same as No. 3, showing greater development; note that some of the flowers on these two clusters have not set seed-balls; (5) longitudinal section of anther showing complete pollen abortion; (6) apparently normal ovule development in flowers which generally drop; (7) cross-section of an anther showing, as in No. 5, practically complete pollen abortion. (Fig. 19.)

few of the common varieties showed the following percentages of defective pollen: Beauty of Hebron, 30%; Early Norther, 44%; Early Rose, 60%; Green Mountain, 67%; White Elephant, 58%, and in a hybrid between Keeper and Silverskin, 89%. When pollen is taken from mature anthers and mounted in lactic acid the defective grains appear empty. The fact that there are empty pollen coverings in the loculi indicates that pollen development is stopped after being liberated from the tetrad. In anthers where there is complete pollen abortion at maturity the pollen appears white instead of the characteristic yellow. After dehiscence the anthers curve backward away from the style. It would appear from the above percentages, that while all of the varieties bear considerable quantities of aborted pollen, in most cases there would be ample normal pollen for self or cross pollination. In one collection of flowers from Early Ohio and Rural New Yorker there was nearly complete pollen abortion. If this were generally the case large fields of either of these varieties would fail to set seed-balls even if the flowers did not drop.

An examination of the pistil, on the other hand, shows that the ovules undergo normal development (Fig. 19, No. 6). There are evidences of disintegration in some embryo sacs but on the whole they appear to be undergoing the usual growth up to the time they are cut off

when the flower drops. Some of the pistils are whitish in color at the base instead of distinct green before the flowers drop, and in those flowers which drop after opening, the abscission layer at the base of the style forms, and occasionally a flower persists long enough for the style to absciss. Receptive stigmas have very few pollen grains on them under field conditions. It often happens that seed-balls develop but bear few mature seeds. Apparently the stimulus from these is sufficient to hold the balls on.

What relation then does the dropping of flowers in the potato bear to the normal functioning of pollen and pistil? Since complete abortion of pollen occurs in many forms in which the pistil functions normally, this factor is not necessarily a cause of dropping, although pollen development is carried up to the liberated microspore. The pistil develops ovules and the stigma becomes receptive in the maturest flowers which shows that normal pistil development takes place in flowers in which the pollen is suppressed. Since the flowers are cut off before the stimulation resulting from pollination or fertilization takes place, this factor can be eliminated. Bloom, likewise, precedes any considerable storage of food material in the tuber. It appears then, that there are physiological influences operating independently of pollen or pistil development which cause the potato flower to drop.

Robert Louis Stevenson on Heredity

"Our conscious years are but a moment in the history of the elements that build us. . . . And though today I am only a man of letters, either tradition errs or I was present when there landed at St. Andrews a French barber-surgeon to tend the health and the beard of the great Cardinal Beaton: I have shaken a spear in the Debatable Land and shouted the slogan of the Elliots; I was present when a skipper, plying from Dundee, smuggled Jacobites to France after the '15. . . . Yes,

parts of me have seen life, and met adventures, and sometimes met them well. And, away in the still cloudier past, the threads that make me up can be traced by fancy into the bosoms of thousands and millions of ascendants: Picts who rallied round Macbeth and the old (and highly preferable) system of descent by females, fliers from before the legions of Agricola, marchers in Pannonian morasses, star-gazers on Chaldean plateaus."