cause changes in the intensity of color or fragrance of a plant (8, 2, 9). However, leaf color is not always a reliable screening tool because nutritional and other environmental factors may mask color differences (3).

The microscopic effects most often associated with polyploid induction are the increased size of the stomates and pollen (3, 8, 14). Barrett and Hutchinson (3) point out that measuring stoma size is too slow and tedious to use as a method of screening large seedling populations; however, it is a useful check. The detection of induced polyploidy by the use of pollen measurements is more accurate than the stoma size method (8) but plants in the flowering stage must be used; whereas stoma measurements can be taken at the seedling stage.

While the screening methods mentioned above are useful, only the counting of chromosomes can be used to confirm polyploid induction (8, 9, 3).

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BREGGER STUDENT AWARD PAPER (1979): Origin of the Macoun Apple Cultivar

JEAN A. HOUSER[1]

Today the Macoun apple cultivar is enjoying renewed interest. Its popularity is increasing for use in both the home garden and commercial production. Macoun is ideal for both retail sales and pick-your-own operations when on the M.9 rootstock. The regeneration of interest in Macoun is due primarily to its excellent fresh eating quality. Some experts consider

[1]Cook College of Rutgers University.

Macoun to be the highest quality dessert type apple grown in the northeast (4, 5, 6).

The Macoun cultivar is the product of a breeding program designed to produce an apple cultivar exhibiting the good characteristics of McIntosh but better in color and later in ripening. In 1909 Richard Wellington made the cross of McIntosh by Jersey Black. Seed were produced in 1909 (2, 3, 4, 5, 6, 7). A number of seedlings from this cross were set out in the nursery in 1910. Several years later in 1912 selections were made while shifting a number of trees from the nursery into the orchard for further evaluation (7). A population of thirty-three trees was formed and from this group after many selections one tree was selected as superior in fulfilling the purpose of the breeding program (5, 7). The seedling was named Macoun after the famous Canadian pomologist W. T. Macoun (5). The seedling was introduced in 1923 without the benefit of further trials (3, 4, 5, 7).

The pistillate parent, McIntosh, belongs to the Fameuse group. McIntosh fruit is attractive with its deep red color and whitish flesh. It is a good medium sized fruit, generally somewhat oblate to roundish in form. The skin is thin, tender, smooth and readily separates from the flesh. The fine textured flesh is crisp, tender, and subacid in flavor becoming almost sweet upon ripening.

The McIntosh tree is vigorous with many small laterals forming a roundish, or spreading type tree. The bark is bright reddish brown with deeply set pubescent buds and many lenticles. The tree has been found to be hardy, healthy and a strong grower. McIntosh comes into bearing at a fairly young age and produces a reliable crop yearly. McIntosh, a midseason cultivar, ripens mid-September to early October depending on the growing region. The crop ripens unevenly and a large portion of the fruit often drop prior to picking, making several pickings necessary (1, 6). McIntosh is a top quality dessert apple and is found widely in commercial plantings.

McIntosh is an extensively used cultivar in breeding programs due to its high quality. Many crosses were made with McIntosh by Wellington other than the one that produced Macoun. Some of the crosses were with Boiken, Duchess, Louise, Rome, Wealthy, and Yellow Transparent. McIntosh carries the dominant gene for many characteristics. McIntosh as a parent, will generally produce a vigorous tree. Fruit size varies, some of the smaller fruited progeny appear similar to crabapples. This leads one to assume that the McIntosh may be ancestrally linked to the crabapple, which may explain the hardiness of the variety. The fruit characteristics exhibited by McIntosh progeny are oblate form, and yellow to red colored skin which may be thick and or tough. The flesh may be white as well as yellowish, and the texture is usually coarse which is uncharacteristic of the parent. The flavor of the flesh varies from slightly acid to sweet. The variable ripening dates of McIntosh descendants has been an asset to breeders. Despite the flaws in the McIntosh genetic material, it has been found to be one of the best cultivars for producing desirable progeny (7).

Jersey Black, an old variety now obsolete, is the staminant parent of Macoun. The history of Jersey Black is for the most part unknown, though it is believed to be synonymous with the black apple described and disseminated by Coxe (1).

The Jersey Black tree is moderately vigorous with slender branches. The rough bark is olive green overlaid by a spotty pubescence. Lenticles are both prominent and numerous. The slightly pubescent buds are medium in size and inconspicuous.

Jersey Black fruit is medium in size and generally roundish in form. They are rather uniform in both size and shape. The skin color ranges from a deep dark red to almost black which degenerates to a lesser red revealing the yellow under color. The skin may be streaked or dotted and have an attractive whitish bloom. The flesh is yellowish white often with a red tinge. The flesh texture is slightly coarse but it is crisp and juicy. The flavor ranges from subacid to mildly sweet with further ripening. Overall, Jersey Black is a pleasant flavored dessert apple (1, 7).

Only when crossed with McIntosh did Jersey Black produce any acceptable offspring. Wellington also crossed it with Canada Baldwin, Jonathan, Louise, and Rome, but no desirable progeny were produced. Jersey Black like McIntosh carries the dominant gene from numerous characteristics. Vigorous tree growth is an evidence in descendants of Jersey Black. The age at which bearing begins for the progeny varies from earlier to later than the parent. The fruit characteristics Jersey Black progeny exhibit are, variable fruit size, oblate form, dark ribbed skin color over a yellow to deep red background, and a bloom is often present on the skin. The white to reddish tinged flesh ranges from sweet to acid in flavor, always producing a good aroma (7).

After observing the characteristics present in the parent and the dominant genetic material found in the parent it is easy to describe the progeny. It is also possible to determine from which parent a specific characteristic present in the progeny originated.

Macoun does not come into bearing until the age of nine which is older than for either parent. Once in bearing the fruit ripen about one month after McIntosh (2, 7). The Macoun has a longer chilling requirement than that of McIntosh; which is quite long, so this tree is not suited for warmer growing regions. Both the tree and fruit buds are hardy so it may be planted well up into the colder production areas (5, 6).

The tree is difficult to grow because of its stiff leggy branches which are generally borne singly with few side branches. The large upright, vigorous nature of the tree is also a problem with maintenance since extra pruning must be done to develop a desirable spreading top. Once bearing begins the upright habit is minimized. The long side branches have numerous spurs present at regular intervals where the fruit are borne. Due to the number of fruit bearing spurs the Macoun has the tendency to over-set, therefore biennial bearing is a problem (2, 3, 4, 5, 6). Over-cropping and biennial bearing are controlled by chemical thinning with 5-10 ppm naphthaleneacetic acid applied within three weeks after petal fall (4, 5). Macoun is diploid, and the pollen produced is viable, about 3,700 pollen grains per anther are produced (5, 6). Even though the bloom season is late, about half a day after Delicious, the pollen of Macount has been proven to produce satisfactory fruit set of McIntosh, Milton, Cortland, other McIntosh seedlings, Northern Spy, and Wealthy, but it is self-unfruitful (5).

The fruit of Macoun is attractive, medium in size and more oblate than either parent. The skin coloration is 90% dark stripe; the stripe ranges from deep red to blackish. The black appearance of the skin is due to the combination of the red pigment in the skin with the green pigment in the outermost cells of the flesh directly below the hypodermis (basecoat color). The smooth skin is rather glossy and also somewhat thick and tough, therefore resisting some surface damage. It is usually covered with a heavy bloom, a characteristic also attributed to its parent Jersey Black (2, 5, 6, 7). The fruit cavity is medium in

depth, narrow and usually symmetrical. The calyx is also medium sized and open, with broad lobes. The stem is thick and very short, plus the fact that the fruit are borne in clusters gives the fruit a tendency to drop by pushing each other off as successive fruit ripen. An excessive drop at maturity can be controlled by the use of 10 ppm naphthaleneacetic acid as a preharvest spray (5, 6).

The flesh is pure white or tinged with red and is for the most part firmer than that of McIntosh. It is fine grained and tender as well as rather juicy. The flesh has a mild subacid flavor along with expelling a fine aroma (2, 3, 5, 6).

The fruit has a relatively long storage life. It is somewhat longer than McIntosh at a temperature of 31° F. Macoun will keep about 110 days. With the use of controlled atmosphere storage the fruit will store until May or June (5, 6).

Macoun is by no means an extinct apple cultivar, a survey done in western New York in 1970 showed 10,000 trees in existing planting ranging in age from one to six years (6). Macoun is also being planted in many other production areas. The replanting of Macoun in many orchards is due to the top quality fruit produced and the high price received for that fruit at the market.

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