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'Spartan' Apple

C. R. HAMPSON,[1] H. A. QUAMME[1] AND R. A. MACDONALD

'Spartan' is the most commercially successful cultivar released from the Agriculture and Agri-Food Canada apple breeding program in Summerland, B.C. 'Spartan' is the third most widely planted apple in the Okanagan Valley, the major producing area of B.C. In total production it ranks behind 'McIntosh' and 'Red Delicious', but 'Spartan' has lost less ground to re-planting with new cultivars than have these other two varieties.

British Columbia is by far the major producer of 'Spartan' in North America, but the variety is also grown to a limited extent in eastern Canada and the U.S.A. (5, 24). Spartan has been grown commercially in the U.K., Denmark, Poland, the Czech Republic, Tasmania and New Zealand (2, 4, 6, 22, 29).

'Spartan' originated from a cross made by R.C. Palmer in 1926 (16). At the time, breeders were looking for an apple that was harvested later than 'McIntosh' and had a better storage life. For more than half a century, 'Spartan' was believed to be a cross of 'McIntosh' X 'Yellow Newtown.' A study of isozyme polymorphism inheritance patterns has since shown that the pollen parent cannot be 'Yellow Newtown' (30), so the amended pedigree is 'McIntosh' X unknown.

The tree designated 26-14-27 first fruited in 1932 and was named in 1936 (16). The name 'Spartan' was chosen to reflect the robust nature of the tree and the good handling characteristics of the fruit. In B.C., major plantings were made in the late 1950s and early 1960s, as 'Spartan' gained grower acceptance due to its early and heavy bearing and very high packouts.

The tree of 'Spartan' is vigorous and upright-spreading with somewhat rigid limbs (6, 8, 18). Micro propagated trees on their own roots were similar in size to trees on Antonovka seedling roots, but less precocious (27). Young 'Spartan' trees have a tendency to produce blind wood, which makes them difficult to train in high density plantings (24). Older trees have good spur development (8). The tree is moderately precocious. Pre-harvest drop is low; the fruit is easy to pick and can be harvested in a single operation.

The fruit is symmetrical, round-conic, with medium uniform size (2.5-3.0 in. diameter). 'Spartan' has an intense, nearly solid, dark red blush that may show indistinct narrow stripes (16). The fruit become well colored before they are mature, and bear a conspicuous heavy purplish bloom. The skin is smooth and highly lustrous after buffing. The calyx end is small with a distinct, ribbed, five-point crown and short erect reflexed sepals. Pedicels are of medium length. 'Spartan' sometimes produces striped bud sports that do not color well in shaded parts of the canopy (17).

The flesh is white, fine, firm, sweet and juicy with a distinctive mild aromatic flavor that does not resemble its 'McIntosh' parent. The core is smaller than in 'McIntosh.' 'Spartan' is chiefly recognized as a dessert apple, but it is also suitable for juice and sauce (1).

In Summerland, 'Spartan' blooms in mid-season, well after 'McIntosh' and before 'Red Delicious' or 'Gala.' It is self-incompatible and requires a pollinizer such as 'McIntosh' (6). 'Spartan' is a regular bearer, but requires moderate to heavy thinning to maintain adequate fruit size. Fruit size is too small in some regions, particularly if the trees are not irrigated. Inadequate size has also been attributed to insufficient pruning and thinning, or picking too early (8). The fruit may also be small in areas where the growing season is short. 'Spartan' thins

[1]Agriculture and Agri-Food Canada. Pacific Agri-Food Research Centre. Summerland, B.C. V0H 1Z0. Contribution no. 1078.

easily with bloom sprays. Most growers in B.C. thin chemically with Sevin at the 10-15 mm stage with good success.

'Spartan' is well adapted to cold regions. It survives in the northern Okanagan Valley where winter temperatures are limiting to some other cultivars (e.g. 'Golden Delicious'). It is hardier than 'Red Delicious', 'Rome Beauty' and 'Newtown', and has survived to –37 C in controlled freeze tests (3). 'Spartan' is less suited to warm regions, where it may show poorer color development, lose its calyx-end crowning and suffer more from preharvest drop (22).

'Spartan' is not resistant to apple scab, but it is much less susceptible than 'McIntosh' (6, 22). 'Spartan' is a source of resistance for cedar apple rust. It is usually free of bitter pit, scald and core flush (6, 22, 29). In Poland, it is reportedly susceptible to bark and wood diseases, such as *Pezicula* (4).

The chief storage disorder is 'Spartan breakdown.' The flesh becomes oxidized, spongy and light brown in color, with prominent dark brown vascular strands (21). The browning begins under the skin and progresses toward the core. The disorder appears after several months of cold storage and may worsen after the fruit is removed from storage (15). Breakdown was such a severe problem at one time that 'Spartan' was withdrawn from the list of recommended varieties for a number of years, ending in 1968. A flurry of research soon established that the major factors in the disorder were low fruit calcium, excess nitrogen fertilization, and high relative humidity in storage (13, 26). Large fruit (over 3 in. diameter) are especially susceptible. The problem is now easily controlled by foliar sprays (14) or postharvest dips of calcium chloride (19, 20), proper nitrogen fertilization, and controlled-atmosphere (CA) storage (8).

The use of 'Spartan' in breeding has been limited, but it has been used as a parent in breeding programs in B.C. and Quebec. Granger et al. (7) recently released 'Belmac,' a cold-hardy, scab-resistant cultivar whose pollen parent is 'Spartan.'

Fruit of 'Spartan' is picked in late September to early October in Summerland, 2-3 weeks after 'McIntosh' and a few days before 'Red Delicious.' 'Spartan' is much more resistant to stem punctures than is 'McIntosh.' The handling characteristics of 'Spartan' make it a suitable variety for distant markets (24). Commercial harvest indices for CA storage include a starch reading of 1.5 to 2 on a 9-point scale, pressure of 17.5 lb and a minimum of 10.5% soluble solids (10). At this starch reading, the core is free of starch but the iodine staining is solid around the fruit perimeter. The fruit will keep for 3 months in air storage or 6-9 months in CA.

'Spartan' is very responsive to CA storage. After the first commercial trial in 1963, the excellent condition of the fruit aroused industry enthusiasm (25). Current recommended CA conditions in B.C. are 1.5% O_2, 1.5% CO_2 at 0 C (11). The eating quality of CA-stored fruit remains good through June. Slightly different CA conditions are recommended in the U.K. (28, 29). Elevated CO_2 in CA storage improved retention of firmness and juiciness in one study (28). Reduction of CO_2 to 0.5% induced core browning, and elevation of O_2 to 2.5% produced scald (9). Lau (11) reported that ethylene scrubbing in CA did not improve firmness retention in 'Spartan.'

The use of edible coatings to preserve firmness and acidity has been investigated (12, 23), but CA was found to be more effective in maintaining these quality aspects and preventing core flush and scald.

'Spartan' is not patented or trademarked, and propagation is unrestricted.

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