

'Totem' Strawberry

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The 'Totem' strawberry cultivar has been a major factor in maintaining the reputation of the Pacific Northwest of North America as a producer of high quality strawberries for the processing market. The cultivar continues to be the most popular throughout the region which includes southwestern British Columbia, western Washington and western Oregon. In 1990, 'Totem' accounted for approximately 58% of the certified plant sales throughout the region with the second and third most widely planted cultivars, 'Sumas' and 'Shuskan' accounting for approximately 9% and 8%, respectively. The 58% represents more than 20 million 'Totem' plants distributed in that year. In British Columbia the cultivar has accounted for as much as 80% of the plantings (6). During the past five years, approximately 65% of the harvested strawberry plantings in Oregon have been 'Totem.'

In many respects 'Totem' is ideally suited to the processing market. It produces relatively firm textured, conic shape fruit which, at maturity, is a uniform, intense medium to dark red color both internally and externally. This color is considered particularly desirable for many processed products including yogurt and jam. The firm texture and the uniform color also give an excellent product when sliced and frozen for dessert packs and when used for individual quick freeze (IQF). The texture is such that the integrity of the fruit is maintained upon thawing. The calyx is easily removed at harvest; this is an essential trait for processing. The size is large and is maintained relatively well throughout the season so that it usually is never less than

medium. This trait, while not absolutely essential for most processed forms, makes for more efficient harvesting.

'Totem' plants have the potential to produce high yields with 5 to 8 tons per acre (11.2 to 17.2 tons per hectare) being common throughout the Pacific Northwest. In Oregon, where the plants have been grown in a modified hill system, at 16" (41 cm) spacing, in double rows on raised beds, yields of 17.5 tons per acre (39.2 tons per hectare) have been obtained (8).

'Totem' originated from a 1962 cross of two Pacific Northwest cultivars, 'Puget Beauty' and 'Northwest' (1). The seedling was selected in a greenhouse bench test as showing resistance to a composite of races of the red stele causal organism, *Phytophthora fragariae* Hickman (1). The desirable fruit traits of the selection were first seen in 1964. During the subsequent trial period, the selection showed at least as much tolerance to a complex of viruses as one of its parents, 'Northwest,' which at that time was the dominant cultivar in the Pacific Northwest (3). This tolerance and considerably more winter-hardiness compared to 'Northwest' were important factors in the decision to name the selection (1). Throughout the Pacific Northwest, 'Northwest' was prone to serious winter injury and had a 75% loss in production in two separate years during the 1960s (5).

One reason for the longevity of 'Totem' has been field resistance to red stele (8). However, in recent years there have been incidences of the breakdown of this resistance. This indicates the occurrence of one or more resistance-breaking races of the causal

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organism, *P. fragariae*. This is not surprising since, in greenhouse screening tests involving four individual races of the organism, the cultivar was resistant to two of the four, moderately resistant to another and susceptible to the fourth (2).

'Totem' has resistant reactions to several other diseases including verticillium wilt (*Verticillium albo-atrum* Reinke & Berth.), leaf spot (*Myco-sphaerella fragariae* (Tul.) Lindau), and powdery mildew (*Sphaerotheca macularis* (Fr.) Magn.) and an intermediate reaction to leaf scorch (*Diplocarpum earliana* (Ell. & Everh.) (6). It also shows some resistance to fruit rots (both *Botrytis cinerea* Pers. ex. Fr. and *Rhizopus* spp.) (1, 6). Pre- or at-harvest reaction to *B. cinerea* is at least partly due to fruit scapes which remain relatively upright until the fruit begins to ripen and also to the firm fruit texture.

The cultivar is relatively susceptible to two-spotted spider mite, *Tetranychus urticae* Koch (2). This can be a problem with the increasing restrictions on the use of chemicals for the control of the pest.

'Totem' is not a prolific runner producer during the year following planting. At times, this has resulted in a shortage of plants available from certified growers. It can also result in relatively low plant numbers in the matter rows, which are traditional in Pacific Northwest strawberry production. This situation can increase the amount of injury after unusually low winter temperatures. The problem of low plant numbers is less likely to occur in subsequent years and it has often been noted that plantings are more vigorous and uniform in these years. This is also a function of the virus tolerance of the cultivar and can result in higher yields in subsequent years compared to the first.

To ensure good survival, 'Totem' plants from certified growers must be fully dormant when dug for subse-

quent storage at -1°C prior to field planting in the spring (4). This contrasts to the situation with other Pacific Northwest cultivars, including 'Sumas' and 'Shuksan,' plants of which show good survival even if not fully dormant when placed into storage. The fully dormant requirement for 'Totem' can be a problem because conditions are quite frequently unfavourable for digging until growth has commenced in the late winter or early spring.

Another problem with 'Totem' plants can occur because of early flowering. The flowers, which are usually produced above the leaf canopy, are sometimes frost damaged with resulting yield reductions (2). This situation is more common in Oregon than further north.

Although 'Totem' fruit is primarily used for processing, it is acceptable for fresh market, especially if harvested before fully ripe and the calyx is retained. It has a pleasant but not highly aromatic flavor. The relatively concentrated ripening habit, though, is not ideal for the fresh market but certainly is desirable for the processing market for which large volumes of fruit per harvest make for greater efficiency.

'Totem' has had some success outside the Pacific Northwest. In Britain it is highly rated by the "pick-your-own" industry for processing as a frozen product. Approximately 250,000 plants of the cultivar are sold annually there. (Paul Walpole, personal communication). Success in some other regions has been limited by high temperatures and light intensities which cause the fruit to darken excessively.

'Totem' has been used extensively in breeding programs as a source of superior fruit qualities and of virus tolerance. It is a parent of the day neutral cultivar, 'Tillikum,' from the Washington State University program, and of 'Redcrest' and 'Bountiful,' both from the Oregon State University-United States Department of Agriculture program. 'Redcrest,' which was

released in 1989 and now occupies approximately 5% of the plantings in the Pacific Northwest, produces fruit suited to processing. It is likely that there will be more cultivars released with 'Totem' or a 'Totem' derivative as a parent.

In 1984, 'Totem' received an outstanding cultivar award from the Canadian Society for Horticultural Science.

'Totem' is likely to remain an important cultivar in the Pacific Northwest for the immediate future. Any replacement cultivar should possess similar fruit qualities with at least as much firmness and less tendency to darken excessively. Plants too should possess qualities similar to those of 'Totem,' with as much or more virus tolerance, but flower later, have the ability for good survival even if not fully dormant when dug for cold storage, have greater runner production in the planting year and have resistance to more races of the red stele causal organism and resistance or tolerance to two-spotted spider mite.

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