'Clé des Champs' Strawberry

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Abstract. 'Clé des Champs' is a new June-bearing strawberry cultivar (*Fragaria ×ananassa* Duch.) bred for Eastern Central Canada and climates similar to Quebec conditions. 'Clé des Champs' was released for pick-your-own and shipping because it has very attractive light red, glossy (Fig. 1), and firm fruit, which have an excellent shelf life compared with 'Kent'.

Origin

'Clé des Champs', tested as LL9324–24, is a progeny resulting from a cross between 'SJ89244–6E' and 'SJ8518–11' made in 1993 by S. Khanizadeh (Fig. 2). 'Clé des Champs' has been tested at the Agriculture and Agri-Food Canada (AAFC) substation in L'Acadie, Quebec since 1994 and during 2000–2004 by our partners Phytoclone Inc. and Lareault Nurseries in Quebec. It has been also tested by other AAFC research centers (Atlantic Food and Horticulture Research Center, Bouctouche, New Brunswick) as well as in Ontario. 'Clé des Champs' is presently being tested in another AAFC research center (Manitoba) and also in Europe by Meiosis (Bradbourne House, Stable Block, East Malling, Kent, U.K.).

Description and Performance

Plants of 'Clé des Champs' are vigorous and produce approximately five inflorescences per crown. They can tolerate winter temperatures below –30 °C with 10 cm straw mulch cover (Table 1). Petioles are short with three, medium-green, cupped, and obtuse

leaflets with obtuse teeth. The terminal leaflets are slightly longer than broad, have a 1.25 length: width ratio, and the flowers are perfect.

'Clé des Champs' produces attractive large, light red, shiny fruit (Fig. 1). The fruit shape is globose-conic. The flesh is orange–

red almost throughout and very firm. Fresh fruit store well for up to 5 d (Table 1) at room temperature (20 °C) with no sign of mold or deterioration compared with 'Kent', in which fruit deterioration is observed after 2 d.

A completely randomized design with four replicates was set up in 2002 and also in 2003 to compare 'Clé des Champs' with selected known commercially grown cultivars. 'Clé des Champs' produces similar yield to 'Kent' and 'Jewel'. Similar to 'Jewel', 'Clé des Champs' produces larger size and firmer fruit compared with 'Kent'. 'Clé des Champs' is a midseason cultivar and 50% of primary fruit are ripe 2 to 3 d after 'Kent'. It is moderately susceptible to leaf spot (*Mycosphaerella fragariae*) and leaf scorch (*Diplaconon earliana*) (Table 2). No symptoms of powdery mildew (incited by *Sphaerotheca macularis* Wallr. Ex Fr.) or gray mold (incited by *Botrytis cinerea* Pers. Ex Fr.) have been noted since 1999. 'Clé des Champs' has similar flavor to 'Jewel' and 'Kent' with similar soluble solid and acidity (Table 2).

Chemical analysis of the fruit by a high-performance liquid chromatography method (Rekika et al., 2005) revealed that 'Clé des Champs' was higher in hydroxycinnamic acids (5.88 ppm p-coumaric acid equivalent) and benzoic acids (27.2 ppm gallic acid equivalent) than 'Kent' and 'Jewel' cultivars (4 and 4.3 ppm; 10.7 and 15.6 ppm, respectively). In contrast, fruit of 'Clé des Champs' contain lower amounts of anthocyanins and flavonols (114.5 ppm cyanidins-3-galactoside equivalent and 4.5 ppm quercetin-3-galactoside equivalent) than 'Jewel' (140.2 and 6.4 ppm, respectively) but slightly higher amounts than 'Kent' (103.8 and 4.2 ppm, respectively). The high potential of 'Clé des Champs' fruit (high firmness, long shelf life, no symptoms of gray mold fruit rot or powdery mildew disease) could be the result of its high content of phenolic compounds,

Fig. 1. Fruit of 'Clé des Champs' strawberry.

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Fig. 2. Pedigree of 'Clé des Champs' strawberry.

Table 1. Total yield, fruit weight, and ripening season of 'Clé des Champs' and comparison genotypes at the L'Acadie site.

Genotype	Total yield ^a (g.m ⁻¹)	Wt./fruit ^a (g)	Ripening season ^b	Shelf life at 20 °C ^c	Hardiness
Kent	2822a	10.4b	EM	2.0	Very hardy
Clé des Champs	1633ab	12.9a	M	5.0	Very hardy
Jewel	1391b	10.9ab	M	4.0	Less hardy
LSD 0.05	1214	2.4		1.0	—

^aAveraged over four replicates from two fields of second year field plantings (2003–2004); data taken from a 1-m-long representative portion of a 2-m matted row (width 50 cm).

^bEM = Early midseason, M = midseason; designations are based on actual harvest dates (early midseason = June 28, midseason = June 30).

^cNumber of days at room temperature (20 °C) with >95% marketable.

LSD = Least significant difference at 0.05 level.

Table 2. Sugar, acidity, firmness, flavor, skin color, leaf disease susceptibility, soluble solids (SS), and acidity of 'Clé des Champs' and comparison genotypes at the L'Acadie site.

Genotypes	Firmness ^a	Flavor ^a	Skin color ^a	Leaf disease susceptibility (leaf spot and leaf scorch)	SS ^b (Brix ^c)	Acidity ^b (% citric acid)
Jewel	4.0	3.5	2.7	Moderately susceptible	8.1	0.83
Kent	3.1	3.0	2.8	Very susceptible	7.5	0.73
Clé des Champs	4.0	3.5	2.7	Moderately susceptible	8.5	0.81
LSD 0.05	0.4	0.7	0.4	—	0.9	0.08

^aAveraged over 2 years from second year plantings (2003–2004), minimum of four replications per year; data taken from a 1-m-long representative portion of a 2-m matted row (width 50 cm). Data were transformed to arcsin before analysis of variance (SAS Inst., 1988). Firmness: 1 = very soft, 5 = very firm; flavor: 1 = poor, 5 = excellent; skin color: 1 = very pale, 5 = dark red.

^bSoluble solid and acidity were measured as described previously (Canada Department of Agriculture, 1963).

LSD = Least significant difference at 0.05 level.

benzoic and hydroxycinnamic acids, as well as their high antioxidant capacity (Rekika et al., 2005; Wang et al., 1994).

Previous findings showed that benzoic acids have antibacterial, antifungal, and antioxidant properties to prevent food spoilage and to enhance quality and shelf life (Baldwin et al., 1995; Khan et al., 1999). Lindhard

Pedersen (2003) found that disease resistance of five black currant cultivars was correlated to high levels of hydroxycinnamic acid derivatives. These acids can react with organic molecules, because amino acid and synthesis of toxic secondary metabolites become highly toxic to pathogen proliferation (Nicholson and Hammerschmidt, 1992).

Area of Adaptation

'Clé des Champs' is recommended for Eastern Central Canada, especially in areas where the climate is similar to that in the strawberry production areas of Quebec. Typically, strawberry production in Quebec occurs in areas with winter temperatures below –25 °C and warm and humid summers with an unpredictable mixture of sun and rain (drought some seasons, constant rain other seasons).

Availability

Canadian Plant Breeder's Rights were granted (Certificate No. 2100, <http://www.inspection.gc.ca/english/plaveg/pbrpov/croproport/str/app00004503e.shtml>) and a U.S. plant patent is pending. The plants of 'Clé des Champs' are available from Lareault Nursery in Quebec (<http://www.lareault.com/cle-des-champs-en.html>). Non-exclusive multiplication licenses can be obtained from Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, Quebec. European nurseries may obtain a multiplication license from Meiosis Ltd. (Bradbourne House, Stable Block, East Malling, Kent, U.K. ME19 6DZ). A limited number of plants are available for research purposes from the corresponding author (SK).

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