‘Co-op 32’ (Pristine™) Apple

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‘Co-op 32’ is a very early, yellow apple (*Malus × domestica* Borkh.) with excellent appearance, very good fruit quality, and outstanding storage ability and shelf life for its season, combined with field immunity to apple scab incited by *Venturia inaequalis* (Cke.) Wint., and resistance to powdery mildew incited by *Podosphaera leucotricha* (Ell. & Ev.) Salm., fire blight incited by *Erwinia amylovora* (Burr.) Winslow, and cedar-apple rust on the fruit incited by *Gymnosporangium juniperi-virginianae* (Schw.). It will be sold under the trademarked name Pristine™ to emphasize its clean, unblemished appearance; the letters “pri” in this name commemorate the Purdue–Rutgers–Illinois cooperative apple breeding program.

‘Co-op 32’ is the eleventh apple cultivar developed by the cooperative breeding program of the Indiana, Illinois, and New Jersey Agricultural Experiment stations (Crosby et al., 1992). This very early, attractive, yellow apple combines disease resistance with outstanding quality, storage ability, and shelf life. In our opinion, it is superior to ‘Lodi’ or ‘Yellow Transparent’, the two other commercial apples that ripen in this early season.

Origin

The original seedling was planted in Apr. 1975 in the HF Block of the apple breeding orchard on the Hinsley Tract of the Purdue Horticultural Research Farm, West Lafayette, Ind., in Row 34; trees were very closely spaced and the tree number was not recorded. When selected, it had the designation PRI 2946-1. The seedling was derived from a cross made in 1974 at New Brunswick, N.J., between ‘Camuzat’, as the seed parent, and ‘Co-op 10’ (PRI 1659-10), as the pollen parent (Fig. 1). Resistance to scab is based on the *V_f* gene

derived from *Malus floribunda* Sieb. 821 (Crosby et al., 1992). The seedling was selected on 2 Aug. 1982 by E.B. Williams, Purdue Univ., carried the location designation HFRow 34, and was released for advanced testing under the designation ‘Co-op 32’ (Crosby et al., 1993). It has been evaluated at Purdue Univ., Rutgers Univ., and by experiment stations, growers, and nurseries in Indiana and Missouri and is now widely distributed for testing throughout the world.

Description

Fruit (Fig. 2) ranges from 60 to 80 mm in diameter and is oblate-round to round in shape. The skin is pale green-yellow to cream turning to bright yellow at maturity, with moderate orange blush along the sun-exposed surface. The skin is very smooth, glossy, nonrusseted with inconspicuous lenticels, and is very attractive. The fruit has a tendency to drop when ripe and may require at least two pickings due to uneven ripening. The flesh is pale yellow, crisp, and slightly breaking, yet melting and medium- to fine-grained. We judge the flavor to be spicy, full-flavored, with a pleasing combination of mild acidity and sweetness. It retains excellent quality and texture for up to 6 weeks in refrigerated storage (0C) and retains acceptable quality for at least 12 weeks or longer, which is unusual for an early apple. Season of maturity at Lafayette, Ind. (40°N), is 20 July to 3 Aug., 4.5 weeks before ‘Prima’ and 8.5 weeks before ‘Delicious’. Compared to ‘Lodi’, ‘Co-op 32’ is ≈1 week later in maturity, has a higher soluble solids concen-

tration, slightly less acidity, and retains firmness longer in refrigerated storage (Table 1). The low internal ethylene concentration at 3 and 4 weeks of ‘Co-op 32’ may be responsible for its longer storage life.

The tree has moderate vigor, is round-topped, spreading with commercially desirable branch angles, 70° to 90° from vertical, with some blindwood at the base of branches. It has a semi-spur-type fruit bearing habit. Branches tend to be limber and have a tendency to droop under a heavy crop load; therefore, heading-back pruning cuts may be required during training. It is moderately productive but will require fruit thinning to achieve optimum fruit size and to reduce the tendency for biennial bearing. The bloom period is mid- to late season, close to ‘Golden Delicious’.

‘Co-op 32’ was tested as a seedling using greenhouse inoculation for resistance to apple scab and was evaluated in the field in the absence of a spray program for resistance to other major apple disease. Scab resistance is based on the absence of sporulation after repeated greenhouse inoculations with *V. inaequalis* races 1–5 using Williams’ (1978) methods. Scab has never been observed on ‘Co-op 32’ in the orchard. Based on a rating scale of 0 (no infection) to 5 (severe infection), ‘Co-op 32’ was rated 0–1 for fire blight, with only a few strikes observed in 1 year on young trees, and 0–1 for powdery mildew. Cedar-apple rust has not been observed on leaves or fruit of ‘Co-op 32’ at Lafayette, Ind., and Columbia, Mo., but has been noticed on the leaves at Cream Ridge, N.J. Because ‘Co-op 32’ is so early, it has not shown any summer diseases, such as sooty blotch incited by *Gloeodes pomigena* (Schw.) Colby or fly-speck incited by *Lepthothyrium pomi* (Mont. & Fr.) Sacc. ‘Co-op 32’ can be grown without fungicides at Lafayette.

The following detailed description follows Zielinski (1955) and used color designations according to the *Royal Horticultural Society Colour Chart* of 1938 and 1941.

FLOWERS

Corolla:	Average of 49 mm in diameter at anthesis.
Petals:	15 × 25 mm; length : width ratio = 0.62.
Color:	Solferino purple 26/1 tight bud to 26/3 in bloom stage; white at anthesis.
Bloom date:	Averages 1 day before ‘Golden Delicious’ in Cream Ridge, N.J.

Fig. 1. Pedigree of ‘Co-op 32’ (Pristine™) apple.

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Fig. 2. Fruit of 'Co-op 32' (Pristine™) apple.

FRUIT		Quality:	Mild acid to sweet, slightly spicy, moderately rich, full flavor, very good to excellent for season.
Shape:	Round oblate, regular, slightly lobed, length : diameter ratio = 0.83.	Color:	White when immature, lemon yellow (4/3) or slightly paler when mature.
Size:	Average diameter varies from 64 to 70 mm up to 80 mm in some locations.	Maturity season:	Ripens 21 July to 4 Aug. in Lafayette, Ind., depending on season, 1 week after 'Lodi' and 1.5 weeks after 'Yellow Transparent', 4.5 weeks before 'Prima', 8.5 weeks before 'Delicious'.
Color:	Sap green (62/2) when immature, becoming white-yellow, and then turning to lemon yellow (4/3 to 4/2). May be blushed along the sun-exposed cheek.	On-tree storage:	Hangs until overripe, although early ripening fruit will drop before main crop is ripe.
Skin:	Very smooth, waxy, thin to medium thickness, inconspicuous lenticels.	Keeping quality:	Maintains quality and texture 4 to 6 weeks at 0C.
Stem:	Medium size and thickness, acute.	Use:	Early summer dessert apple.
Basin:	Medium depth, medium breadth, rounded, wavy to lobed.	TREE	
Calyx:	Recurved.	Growth habit:	Moderate vigor, round top, spreading, good crotch angles, some blindwood at the base of branches, semi-spur-type bearing habit with limber wood that has some tendency to droop under a
Calyx tube:	Conical, median.		
Core lines:	Clasping.		
Core:	Median, closed.		
Carpels:	Emarginate, smooth.		
Seeds:	Full complement, acute.		
Flesh:			
Texture:	Crisp, slightly breaking yet melting, medium- to fine-grained; moderate browning upon exposure to air.		

heavy crop load. Tendency to set fruit heavily on 2-year-old wood.

Leaves: Ovate to oval, serrate to double serrate, apex acute, base rounded, length : width ratio = 1.39.

Pruning/training requirements: Limber wood on young trees may require heading-back pruning; should be trained as other standard semi-spur trees.

Branch angles: Commercially desirable branch angles, 70° to 90° from vertical, with little tendency for bark inclusions in crotch.

Pollination: Requires cross-pollination for optimum yields.

Productivity: Moderately productive.
Thinning: Will require thinning to achieve optimum fruit size.

Bark: Current-year stems are Maroon (1030/2) on sun-exposed surface, Pea Green (61) on underside. Lenticels on 1-year-old wood are raised, ≈1 mm in diameter, Apricot 609/3; lenticels on 5-year-old trunks are rough, about up to 1 × 7 mm, commonly 1 × 4 mm, Apricot (609/1).

Availability

Budwood is available for test purposes to federal and state experiment stations. The Purdue Research Foundation has applied for a plant patent under the name 'Co-op 32'. Trees will be available in 1995, and thereafter, from licensed nurseries under the trademark Pristine™ apple, which is a trademark of the Purdue Research Foundation.

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Table 1. Quality characteristics of 'Lodi' vs. 'Co-op 32' at harvest (21 July for 'Lodi' and 28 July for 'Co-op 32') and after storage at 0C. Three apples sampled for each cultivar at each date.

Storage duration (weeks)	Resistance (N)		Soluble solids concn (%)		Acidity (g malic acid/100 ml)		Core ethylene (ppm)	
	Lodi	Co-op 32	Lodi	Co-op 32	Lodi	Co-op 32	Lodi	Co-op 32
0	63.7 ± 2.0 ^a	59.8 ± 2.0	9.9 ± 0.3	10.2 ± 0.3	0.9 ± 0.0	0.7 ± 0.0	49.3 ± 48.0	31.5 ± 19.6
1	66.6 ± 2.0	56.8 ± 2.0	9.0 ± 0.2	12.4 ± 0.1	1.0 ± 0.0	0.7 ± 0.1	12.6 ± 2.2	17.4 ± 6.1
2	68.6 ± 2.0	65.7 ± 3.9	10.6 ± 0.5	13.0 ± 0.4	0.9 ± 0.0	0.7 ± 0.0	22.7 ± 0.9	46.3 ± 5.1
3	49.0 ± 4.9	68.6 ± 2.0	10.3 ± 0.2	13.6 ± 0.4	0.8 ± 0.1	0.8 ± 0.2	85.6 ± 33.4	22.2 ± 7.0
4	41.0 ± 2.9	61.7 ± 2.0	10.2 ± 0.4	12.0 ± 0.3	0.8 ± 0.1	0.7 ± 0.0	52.4 ± 18.2	18.4 ± 11.3

^a±SE.