

IPR 98: Rust-resistant dwarf arabica coffee cultivar for dense spacing

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ABSTRACT – *The IPR 98 coffee cultivar is a dwarf plant smaller than the Catuaí Vermelho IAC-81 cultivar, completely resistant to Hemileia vastatrix Berk. et Br. with medium precocity in ripening and superior quality and high yields with semi-dense, dense and super dense spacing in lower temperature coffee regions of the state of Paraná.*

Key words: *Coffea arabica*, crop breeding, Híbrido de Timor, rust disease.

INTRODUCTION

The coffee breeding program of the Paraná Agronomic Institute (Instituto Agronômico do Paraná - IAPAR), state of Paraná, Brazil, has been conducted since 1973 (Sera 2001). This breeding program is based on the IAPAR coffee model (Sera 2000) with high density spacing of between 4,000 and 12,000 plants ha⁻¹, involving many integrated technologies of different knowledge areas. The development of all released cultivars was aimed at: high yield per ha, lower cost per bag, improved quality and better production stability (Sera et al. 1996). IPR 98, released in 2004, is a dwarf cultivar, resistant to rust disease (*Hemileia vastatrix* Berk. et Br.) and recommended for semi-dense, dense and super dense planting systems in lower temperature areas with annual average between 18 °C and 21 °C in the state of Paraná.

PEDIGREE AND BREEDING METHOD

IPR 98 was derived from a cross between *Coffea arabica* “Villa Sarchi CIFIC 971/10” and Híbrido de Timor CIFIC 832/2 [*C. arabica* var. *arabica* x (*C. arabica* var. *arabica* x *C. canephora*)], performed at the Center for Coffee Rust Investigation (Centro de Investigação das Ferrugens do Cafeeiro (CIFIC), in Portugal, where it was named HW 361. The F₂ generation (HW 361-4) was received by the Campinas Agronomic Institute (Instituto Agronômico de Campinas – IAC) and named LC 1669. In 1975, IAPAR introduced the F₃ generation (LC 1669 Ep127 c.31), named PR 75163. Of this progeny with 24 plants, the plant number 21 was selected, that originated the F₄ progeny PR 75163 – 21. In 1981 the F₄ progenies were evaluated for all 30 physiological rust races at CIFIC (Cardoso et al. 1996) and at least four resistance genes

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(S_H6, S_H7, S_H8 and S_H9) were found in 93% of the plants. One plant with higher plagiotropic branching was selected, that originated the F₅ progeny PR LF 75163 – 21 – 10, later named IPR 98. This genotype was evaluated during six growing seasons in three crop environments in the state of Paraná and then released as cultivar.

PRODUCTIVITY

The IPR 98 cultivar was evaluated for six years in three coffee regions, Carlópolis, Londrina and Loanda in the state of Paraná. The mean yields of six years in the three coffee regions of IPR 98, Catuaí Vermelho IAC 81 and Mundo Novo IAC 376-4 are shown in Table 1. The yield per plant of IPR 98 is lower than the dwarf cultivar Catuaí Vermelho IAC-81 but 25% higher if considered per area. This cultivar, shorter than Catuaí Vermelho IAC-81, is ideal for a dense planting system, as it is most used in the IAPAR coffee system (Sera 2000).

OTHER TRAITS

IPR 98 is a short plant recommended preferably for semi-dense (e.g. 2.5 m x 0.5 m), dense (e.g. 2.0 m x 0.5 m) and super dense (e.g. 1.5 m x 0.5 m) planting in lower temperature regions in the state of Paraná, where the maturation of this medium ripening cultivar usually occurs at the beginning of July in Londrina while for Catuaí Vermelho IAC-81 maturation occurs in August and in June for IAPAR 59. This ripening cycle reduces frost losses to only one instead of two years per biennium, because most fruits are already ripe when the frost occurs, so only the yield of the second year is affected.

IPR 98 can be used for sequenced harvest (Sera and Guerreiro 1996) in association with other rust-resistant dwarf coffee cultivars with different ripening

times in order to reduce the labor, infrastructure and equipment requirements. IPR 98 is harvested between 7 and 30 days after IAPAR 59, depending on the average annual temperature (18 to 23 °C). By using IPR 98 with other maturation group cultivars such as IAPAR 59 (semi-early) and Catuaí Vermelho IAC-81 (late) in sequenced harvests, the rain risk at harvest time is reduced and it is easier and cheaper to produce quality coffee in the rainy and cool coffee regions of Paraná state.

The cup quality of IPR 98 is similar to IAPAR 59. The aroma, acidity, body, flavor and sweetness are similar to IAPAR 59, which won the cup quality competition of the Brazilian Association of Coffee Roasters (ABIC). The sweetness is higher and acidity is lower than of Catuaí Vermelho IAC-81. The specific cup quality of IPR 98 is therefore similar to other commercial cultivars.

Currently, IPR 98 is completely resistance to all rust physiological races found in Brazil. It probably carries simultaneously at least four S_H resistance genes (e.g. S_H6, S_H7, S_H8, S_H9) derived from Híbrido de Timor CIFC 832/2. The secondary plagiotropic branching of IPR 98 is higher than of Catuaí and IAPAR 59. These and other traits are described in Table 2.

SEED MAINTENANCE AND DISTRIBUTION

IPR 98 is registered by the National Cultivar Registry (Registro Nacional de Cultivares – RNC) of the Ministry of Agriculture, Fishing and Supply (Ministério da Agricultura, Pecuária e Abastecimento – MAPA) under number 09950 and is protected by the Nation Cultivar Protection Service (Serviço Nacional de Proteção de Cultivares – SNPC) in Brazil (no. 00724). The IAPAR breeding program is in charge of genetic seed, the Seed Production Program of IAPAR is responsible for basic seed and private seed producers registered in MAPA are responsible for certified seeds.

Table 1. Annual average yield per area (bags of 60 kg ha⁻¹) and per plant (kg pl⁻¹) of the IPR 98 cultivar in six successive harvests in Carlópolis, Londrina and Loanda in the state of Paraná, Brazil

Cultivar	Plants ha ⁻¹	Spacing	Yield ha ⁻¹	Yield pl ⁻¹	% ¹
IPR 98	8000	2.50 m x 0.5 m	79	0.592	123
Catuaí Vermelho IAC 81 ²	6060	2.75 m x 0.6 m	64	0.634	100
Mundo Novo IAC 376-4 ²	4761	3.00 m x 0.7 m	56	0.706	86

¹ Relative yield of IPR 98 compared with the standard Catuaí Vermelho IAC 81.

² With rust control.

Table 2. Morphological, physiological and agronomic traits of the IPR 98 cultivar with the respective descriptions

Traits	Descriptions
Size (Tree height)	Small (= IAPAR 59)
Canopy radius	Small (= IAPAR 59)
Canopy architecture	Cylindric-conical (= 'Acaiaí IAC 474-7')
Internode length	Short (= IAPAR 59)
Secondary plagiotropic branching	High
Young leaf color	Green
Leaf size	Medium to large (larger than Mundo Novo) cultivars
Color of ripe fruits	Red
Fruit shape	Oblong
Grain size	Medium (= Catuaí)
Grain length	Medium to Long (between Mundo Novo and "Acaiaí")
Grain width	Narrow to medium (between Mundo Novo and "Acaiaí")
Ripening cycle	Medium (between IAPAR 59 and 'Tupi IAC 1669-33')
Undulation of the leaf margin	Medium wavy (= Catuaí and Mundo Novo)
Resistance to rust (<i>Hemileia vastatrix</i>)	Complete resistance
Resistance to nematodes	not yet identified
Reaction to <i>Pseudomonas syringae</i> pv. <i>garcae</i>	Susceptible
Reaction to <i>Cercospora coffeicola</i>	Susceptible
Cup quality	Similar to Catuaí and Mundo Novo cultivars

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