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Outbreak of coffee leaf rust (*Hemileia vastatrix*)in Colombia

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In Colombia, coffee cultivation covers 850,000 ha, of which 41% comprises cultivars of *Coffea arabica* that are susceptible to leaf rust (CLR) caused by *Hemileia vastatrix* Berk. et Br.CLR, first recorded in Colombia in 1983, is the most damaging coffee disease, causing 30% crop losses when left unmanaged. In Colombia, major epidemics of CLR had not been reported since 1987 (Leguizamón & Arcila, 1991). However, during the 2008 to 2011 growing seasons, an unusual increase in disease incidence and high leaf severities (>30%) were recorded in several susceptible commercial coffee fields, predominantly in the Departments of Tolima, Caldas, Cauca and Antioquia. We performed assays for the molecular and phenotypic characterisation of coffee rust isolates taken before and during the current epidemics. Thirty new pure cultured isolates were derived from single rust pustules taken from distinct coffee regions and contrasting altitudes. Tests on a set of coffee differential plants performed at CIFC in Oeiras, Portugal, showed that the majority of isolates were race II of *H. vastatrix*. Only two isolates could not be assigned to any known *H. vastatrix* races. Aggressiveness tests including incubation and latency period,and spore density showed that the isolates causing the epidemics were not more aggressive than pre-2008isolates.The use of 100 SSR markers (GenBankAccession Nos. JF288615 to JF288714) showed genetic identity among 30 *H. vastatrix* isolates taken during the rust outbreak and 30 isolates collected before 2008. The multi-line cultivars Colombia and Castilloderived from crosses between Caturra and Timor Hybrid 1343 continued exhibiting resistance against CLR.

Differences in environmental and agronomic conditions during the period 2008-2011were considered as possible causes of the CLR epidemics. The rust outbreak was associated with high rainfall resulting from La Niña together with sunlight reductions due to cloudy skies and a narrower range between maximum and minimum daily temperatures. In the Colombian central coffee-growing region, annual precipitation has exceeded 3,000 mm during the last seven years, being close to the average (2,400 mm) only in 2007. A similar pattern was observed in most of the climatic stations located all over the coffee growing regions where solar irradiation was below average (1,775 hours per year); a condition that favours *H. vastatrix* development (Rayner, 1961; Bock, 1962; Avelino, 2006). Inadequate fertiliser application evidenced by low fertiliser sales (due to major price increases) and deficient nutrient uptake in water-saturated soils slowed shoot growth, thus preventing plant recovery. The CLR outbreak responsible for coffee production losses in Colombia in 2008 to 2011 was caused by isolates belonging to race II, the prevalent race of *Hemileia vastatrix* in Colombia since 1983. There does not appear to have been an increase in host susceptibility to this race. It is considered that optimal weather and agronomic conditions for disease development favoured major CLR epidemics from 2008 to 2011.

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