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PROGRAMME & ABSTRACTS

AGRONOMY | BIOTECHNOLOGY
PHYSIOLOGY | CHEMISTRY
PROCESSING | COFFEE & HEALTH
SUSTAINABILITY | CLIMATE CHANGE
COFFEE QUALITY | PESTS & DISEASES
GENOMICS & GENETICS

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Shade effects on coffee rust are controversial, possibly because shade helps to prevent high fruit loads, which decreases leaf receptivity to the pathogen but, at the same time, might provide a better microclimate for germination and colonization. These two probable antagonistic pathways are combined under natural conditions.

In order to clarify their individual effects, we dissociated the two factors by manually homogenising fruit loads under two light exposure situations, under shade and in full sunlight.

The trial was set up in Turrialba, Costa Rica at 600 m of elevation, in a coffee plot initially under shade provided by the tree legume *Erythrina poeppigiana*. The plot was subdivided into two subplots: one was maintained under shade, whereas shade was eliminated in the second subplot. In each subplot, we removed fruiting nodes from 40 coffee plants in order to obtain the following four levels: none, 150, 250, and 500 fruiting nodes per coffee plant. Coffee rust incidence and severity, along with plant growth and defoliation, were assessed on these coffee plants over a period of two years. Air and leaf temperatures, leaf wetness and relative humidity were also monitored.

As expected, the intensity of the coffee rust epidemic increased in line with fruit load. We quantified a 28.9% increase in coffee rust incidence and a 129.2% increase in severity on plants with 500 fruiting nodes as compared to plants with no fruits. With the homogenised fruit load, the intensity of the coffee rust epidemic was greater in the shaded subplot, with a 21.5% increase in incidence and a 22.4% increase in severity. Two mechanisms were suggested. Firstly, we highlighted a dilution effect due to host growth which was 25.2% and 37.5% greater in full sunlight when considering new leaves or new leaf area respectively. Secondly, the microclimate was more conducive to coffee rust under shade, with lower intra-day temperature variations, due to lower maxima, and a higher leaf wetness frequency.

We concluded that shade has antagonistic effects on coffee rust. Coffee rust is reduced by shade because shade reduces the number of fruiting nodes and the number of fruits per node. However, with an equivalent number of fruiting nodes, coffee rust incidence and, to a lesser extent, severity were greater under shade. The service provided by shade in controlling coffee rust is necessarily associated with a disservice that consists in reducing yield in the short term.