Puccinia oxalidis Dietel & Ellis (1895): first report controlling oxalis latifolia kunth (Oxalidaceae) in systems of direct planting

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A hypothesis studied is that \textit{P. oxalidis} can control \textit{O. latifolia}, reducing or avoiding the use of chemicals to manage this plant in less disturbed systems such as in no-tillage, with powdered pustules on the abaxial surface of infected leaves (Lee et al., 2019), which quickly become powdery (Verslyus, 1977), reducing growth and causing the wilting and death of this plant (Figure 2). The golden yellow color of rust urediospores of \textit{P. oxalidis} is due to the carotenoid pigments accumulated in the lipid droplets in its structure (Wang et al., 2019).

\textit{Puccinia} spp. develop better and sporulate on the target plant, without damage to the crops, due to the microclimate of the decomposing straw in no-tillage, controlling different weeds like \textit{Fallopia japonica} (Ueda et al., 2018). The straw can improve the environment for natural enemies (Trewavas, 2004), like this fungus, due to humidity and...
Figure 1. Clover (*Oxalis latifolia*) under no-tillage of the *Allium sativum* L. culture (A), rust caused by *Puccinia oxalidis* on the abaxial surface of the clover leaf (B), *P. oxalidis* pustules under a stereomicroscope (magnifying glass) (C), *P. oxalidis* urediniospore with circular shape (D).

Figure 2. Stages of infection by *Puccinia oxalidis* in clover (*Oxalis latifolia*). Clover leaf without rust infection (A), onset of rust infection (B), rust across the leaf abaxial surface (C), leaf severely infected with symptoms of wilt and necrosis (D).
mild temperatures while reducing the competition between *O. latifolia* and garlic plants. The biological control by the fungus *P. oxalidis* prevented the competition of *O. latifolia* with garlic plants in no-tillage, even though it was the main weed species at 60 days after the beginning of this culture.

The weed *O. latifolia* predominated in the plots with no-tillage, but the rust on its leaves, caused by the fungus *P. oxalidis* reduced the competition, making additional weeding during the garlic plant cycle unnecessary for the management of this weed.

The biological control of *O. latifolia* by *P. oxalidis* was efficient without affecting the garlic plants under no-tillage.

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