Distinguishing rust fungus species on Bramble *Rubus fruticosus* agg. [Version 3]

Additions in blue

General notes on rusts

Can have up to five spore-producing stages but not all species have the full set. Three stages are prominent if present and are used in identification. They are often distinguished by Roman numerals:

(0 spermogonia producing spermatia) <- added by Tony Moverley

I aecia producing aeciospores

II uredinia producing urediniospores (uredospores)

III telia producing teliospores (teleutospores).

In some species (including those on Bramble) aeciospores and uredinospores are difficult to distinguish so the hints below do not require this.

Rusts on Bramble

Three rust fungi commonly occur on Bramble:

Kuehneola uredinis Pale Bramble Rust
Phragmidium violaceum Violet Bramble Rust
Phragmidium bulbosum

All have stages which are yellowish so this is not a reliable means of distinguishing. Both can be on stems and petioles as well as leaves.

Clues to distinguish species:

1 If pale yellow spore masses are on upper surface of leaf, must be *Kuehneola* (aecia). These are not pulverulent (fluffy). If on lower surface could be either *Phragmidium* sp. (aecia or uredinia) or *Kuehneola* (uredinia).

2 All stages of *Phragmidium violaceum* are on red-purple spots; all stages of *Kuehneola* are on yellowish spots. This would seem to be definitive but I would like to check it against observation.

3 If paraphyses are present (aecia or uredinia) then *Phragmidium* sp; absent in both stages of *Kuehneola.*

4 Both aeciospores and urediniospores of *Phragmidium violaceum* are ornamented 'distantly and strongly aculeate-verrucose'; those of *Kuehneola* are 'finely and closely verrucose-echinulate'. [But aeciospores of *P. bulbosum* have distinctive flattened warts.]

One source notes that *Kuehneola* uredinia can cover virtually the whole underside of a leaf with masses of tiny aecia.

Season does not separate unless stages can be distinguished:

Kuehneola uredinis Stage I July-August; Stage II April-May
Phragmidium violaceum Stage I May; Stage II August-September

Distinction between *P. violaceum* and *P. bulbosum* is usually made by examination of the teliospores – 2-4 septate (mostly 3-septate) in *P. violaceum* and mostly 5-septate in *P. bulbosum*. The teliospores of *K. uredinis* are very different – yellowish chains of thick-walled cells (and rare).

British Plant Galls (2011) separates telia of *Phragmidium* species by *P. violaceum* being below red-purple spots which are absent in *P. bulbosum*.

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Note: a useful on-line source of information on plant parasitic fungi is *Plant Parasites of Europe* (includes galls and leafminers as well as microfungi) at https://bladmineerders.nl/