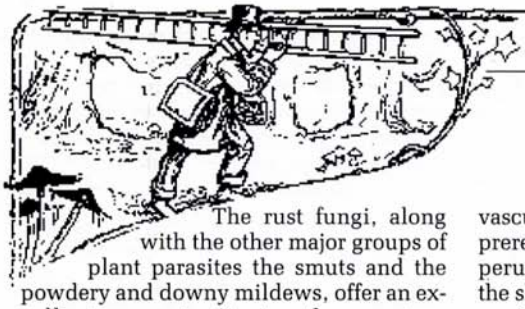

FIRST STEPS

WHY NOT LOOK AT THE RUST FUNGI?

The rust fungi, along with the other major groups of plant parasites the smuts and the powdery and downy mildews, offer an excellent opportunity to the amateur mycologist who is tempted to explore the fascinating but apparently arcane world of the micro-fungi.

It is ironical that, generally speaking, anyone wishing to undertake serious study of the larger fungi must have access to a microscope if any but the most striking and distinctive species are to be named with confidence. Yet, largely due to their highly specialized life-styles, a much higher proportion of the plant parasites can be identified — often in the field — without recourse to microscopical analysis. Also, because the peak time for finding the rusts at their most conspicuous is during the summer, they afford a useful area of mycological activity at a time when fruiting macro-fungi are scarce. Finally, because the national distribution of the vascular plants is so well known (Perring & Walters, 1976), one can make comparisons between the ranges of host and parasite. It does not always follow that a common plant must have a common rust — Hogweed and Goatsbeard spring to mind.

The chief way in which the rusts differ from other groups which the beginner may have encountered is that they can have up to five spore stages in the course of their life cycle. These stages do not always occur on a single host: one of the fascinating features of these fungi is the way in which alternating spore stages may occur on taxonomically widely-separated vascular plants — gymnosperms and phanerogams, dicotyledons and monocotyledons. Indeed, if one looks at old county floras one can find what is now known to be a single species under two different names. It was only by careful experimentation (in which amateurs often played a valuable part) that the links were established.

A reasonably sound knowledge of vascular plant identification is a necessary prerequisite for the study of rusts. A quick perusal by the writer of the host ranges of the slightly over 300 rust taxa known to occur in Great Britain and Ireland would suggest that some 75% can be identified by reference to their host plant and macroscopic appearance alone. The rusts are well distributed throughout the families of vascular plants, but some families are more productive than others. These include the Leguminosae (with numerous rusts in the genus *Uromyces*), the Rosaceae (*Phragmidium, Triphragmium, Frommea* et al.), the Umbelliferae (mostly *Puccinia* species — this is perhaps the most prolific of all the families as regards the number of different species in relation to hosts, with half of the 60 or so British native or well-naturalized species being attacked, usually by a specific rust), and the Gramineae (although here a microscope and a much more critical approach are needed).

Collection and study

As mentioned earlier the summer is the peak time for finding rusts, although some species can be found throughout the year. They occur in virtually all terrestrial habitat types and can be found in the middle of large towns and cities, in gardens, parks and especially on waste-ground. Indeed in the latter, because of the nature of the habitat, the host plant is ofter under a certain degree of stress, which can lower resistance to attack by pathogenic fungi, and such sites are often fruitful hunting grounds. All that is needed for their study is a hand-lens and some used envelopes or polythene bags (the sealable ones are very useful). Although the latter are certainly not appropriate for the collection of the larger fleshy fungi, for the rusts they have the advantage of keeping material fresh for a couple of days, particularly if specimens are kept cool. (One should avoid mixing collections in the same bag, as stray spores may cause confusion if accurate measurements are required for identification).

There follows a list of host plants, arranged by habitat, which the beginner is recommended to examine for their rusts (indicated in brackets); successful results should soon be achieved as these rusts are common. The list and comments are largely based upon the writer's experience in Yorkshire, but should hold true for Britain as a whole.

Woodland: Violets (*Puccinia viola* on several species — but not on Marsh Violet which has its own, rare, rust); Lesser Celandine (*Uromyces ficariae* and *U. dactylidis* — these are included in the BMS list of target organisms for mapping); Dog's Mercury (*Melampsora populnea*); Wood Speedwell (*Puccinia veronicae*) — a somewhat local old-woodland plant, but the rust is frequent where it occurs); Bluebell (*Uromyces muscari* — although this is often restricted to a few plants in large areas of host); Ramsons/Cuckoo Pint/Lily-of-the-Valley/Herb Paris (*Puccinia sessilis* occurs on all these, and others, in descending order of frequency).

Grassland: Purging Flax (*Melampsora lini* var. *lini*); Great Burnet (*Xenodochus carbonarius*); Barren Strawberry (*Phragmidium fragariae*); Pignut (*Puccinia tumida* and the rarer *P. bistortae*); Betony (*Puccinia betonicae*); Creeping Thistle (the very common *Puccinia punctiformis*); Spear Thistle (*Puccinia cnici*).

Marshland: Meadowsweet (*Triphragmium ulmariae*); Water Mint (*Puccinia menthae* — this also occurs on several other members of the mint family).

Coastal sites: Thrift (*Uromyces armeriae*); Alexanders (*Puccinia smyrnii* this can generally be found throughout the year); Sea Lavender (*U. limonii*).

Wasteland: Knot-grass (*U. polygoni-avicularlae*); Mugwort/Wormwood/Tansy (*Puccinia tanaceti* — in Yorkshire at least this species appears to be on the increase); Coltsfoot(*Coleosporium tussilaginis* and *Puccinia poarum* — a little care is needed to distinguish these on first acquaintance, but they are soon recognised); Nipplewort (*Puccinia lapsanae); Groundwell/Oxford Ragwort (Puccinia lagenophorae* — an Australian species only discovered in Britain in 1961, now abundant).

Gardens: *Mahonia* spp. (*Cumminsiella mirabilissima; Hypericum* spp., particularly Tutsan (*Melampsora hypericorum*); Snapdragon (*Puccinia antirrhini*); Mints (*P. menthae*); Chrysanthemum spp in greenhouses (*Puccinia chrysanthemi* and *P. horiana*); Iris spp (*Puccinia iridis*).

An interesting feature of the last three years has been the increase in records of rusts on ferns. These rusts, which often appear white and rather 'un-rustlike' in the field, are to be found on senescent fronds of the previous year, the best time to look being from mid-winter to spring. Male Fern and Broad Buckler-fern are recommended for the beginner, but many other species have their rusts, some of them enticingly rare.

Literature

Several of the introductory books on fungi, e.g. Webster (1970), Ingold (1973) contain details of the physiology and life-histories of selected rust species. For serious study in this country access to Wilson & Henderson (1966), and its update by Henderson and Bennell (1979) are essential. The former is out of print but the latter may still be available (as an off-print) from the Royal Botanic Garden, Edinburgh. Fortunately, the treatment of rusts in Ellis & Ellis (1985) is quite adequate for the beginner, particularly in its arrangement by host species.

There will be a BMS day foray on 11th August 1990 in Miller's Dale, Derbyshire, when plant parasites will be the main quarry. The writer would be pleased to receive well-collected, pressed material for determination or confirmation, providing specimens are accompanied with adequate information on host, locality, date, etc., and a stamped addressed envelope.

FURTHER READING

Cummings, G B (1971). *The Rust Fungi of Cereals, Grasses and Bamboos*. New York.

Ellis, M B & Ellis, J P (1985). *Microfungi on Land Plants: An Identification Handbook*. London: Croom Helm.

Henderson, D M & Bennell, A P (1979). British Rust Fungi:: Additions and Corrections. *Notes from the Royal Botanic Garden Edinburgh*, **37**, 3: 475-501.

Ingold, C T (1973). *The Biology of Fungi* (3rd ed.). London: Hutchinson.

Perring, F H, & Walters, S M (1976). *Atlas of the British Flora* (2nd ed.). Wakefield: E.P. Publishing.

Wilson, M & Henderson, D M (1966). *British Rust Fungi*. Cambridge.

C. Yeates
Clifton Park Museum,
Rotherham, S Yorkshire S65 2AA