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The alterations of plumage of parasitic origin

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ABSTRACT

Described herein are the main lesions to the plumage caused by insects and mites, both on the vane or the calamus of feathers. Practical data are given, aimed to make a correct differential diagnosis. *Mallophaga* cut the barbs of feathers, whereas *dermestidae* can cut also the rachis. Mites make holes in the vane of feathers and sometimes they stick the barbs the ones to the others or they attack the calamus both inside and by digging tunnels in the outside wall of the calamus causing the fall of feathers.

Key Words: Insects, Mites, Plumage, Calamus, Vane.

RIASSUNTO

ALTERAZIONI DEL PIUMAGGIO DI ORIGINE PARASSITARIA

Vengono descritte le principali lesioni al piumaggio prodotte da insetti ed acari, sia sulla parte vessillare delle penne, che sul calamo, fornendo elementi concreti per una corretta diagnosi differenziale. I mallofagi tagliano le barbe delle penne, mentre i dermestidi possono reciderne anche il rachide. Gli acari forano la parte vessillare delle penne e talora ne appiccicano le barbe, oppure attaccano il calamo sia internamente che scavando tunnel nella sua parete esterna, causando la caduta delle penne.

Parole chiave: Insetti, Acari, Piumaggio, Calamo, Vessillo.

Introduction

Arthropods can interact with fowls damaging their plumage, breaking, perforating and also causing its loss. Some attack preferably the calamus, some others the vane of the feathers. The lesions reported are almost always well distinguishable to the naked eye or by the aid of a stereomicroscope, but it is not always easy to find out the arthropod that causes them. To this aim, the main kinds of lesions of feathers occurred to our observation during the past ten years were selected in order to make it easy to effect a differential diagnosis and quickly to reveal the agent causing the pathology.

Material and methods

A number of 520 fowls was examined belonging to the families *Struthionidae*, *Turnicidae*, *Phasianidae*, *Anatidae*, *Psittacidae*, *Columbidae*; *Passeriformes* of the families *Cinclididae*, *Troglodytidae*, *Sturnidae*, *Estrildidae*, *Fringillidae*, *Corvidae*, *Ploceidae*, *Turdidae*, *Alaudidae*, *Hirundinidae*, *Motacillidae*, *Sylviidae* and *Paridae*.

The macroscopic exam of plumage was carried out on them, by a stereomicroscope and at the same time the isolation of all the arthropods present was effected by using micro-needles and thin-pointed pincers. The feathers damaged and the

arthropods isolated were kept in 80% alcohol, whereas some samples were clarified in warm lactic acid and mounted on slide in Berlese's solution to be identified.

To circumscribe the field of our research, in this study some mites causing mange and other causing indirectly the loss of feathers without lesions observable macroscopically were excluded.

Results and discussion

The arthropods identified as agents causing evident lesions of plumage belonged to two classes: *Insecta* and *Acarina*. In the former, two orders were recorded of particular interest for the plumage: *Mallophaga* and *Coleoptera*; in the latter, the order *Actiniedida* (= *Prostigmata*) and *Acaridida* (= *Astigmata*) (Table 1).

The insects are a cause mainly of macroscopic lesions on the vane of feathers, which can weaken and break, whereas mites cause less evident lesions both to the feather barb and to the calamus, determining in some cases its loss. Among insects, the first to be isolated are *Mallophaga* belonging to the suborders *Amblycera* and *Ischnocera*. All of them have a strong masticatory mouth apparatus, but unable to cut the rachis of bigger feathers, such as the flight feathers (remiges - primaries, secondaries and tertials) or the tail feathers (rectrices). On the contrary they can cut the dorsal and pectoral small feathers and the feathers of sides under the wings. Their action on the barb is linear and very precise. The feather appears cut horizontally and each barb is cut singularly. When *Mallophaga* are very young, they cut the barbules and make small holes close to

Table 1. Classification and main characters of insects and mites affecting plumage.

Parasite	Localization	Lesion	Degree of seriousness
<i>Mallophaga</i>	Mainly underwing coverts, dorsal and pectoral feathers	Young <i>Mallophaga</i> : cut the barbules and make small holes ranged horizontally Adult <i>Mallophaga</i> : lean cut the barbs horizontally causing breaking of feather	Seriousness in proportion with the number of parasites
<i>Coleoptera</i> <i>Dermestidae</i>	Mainly tail feathers and flight feathers	They clench barbs in groups. They can cut also the rachis, breaking the feather	They cause the depreciation of birds
Feather vane mites: <i>Pterolichidae</i> , <i>Analgidae</i> , <i>Proctophyllodidae</i> , <i>Dermoglyphidae</i> and others	Flight feathers (primaries)	They shift or cut the barbules producing small holes ranged irregularly	They cause the loss of impermeability of feathers
Internal calamus mites: <i>Syringophilidae</i>	Inside the calamus	They cause inflammation of feather papilla	They cause the fall of feathers, above all of the upperwing medial and lesser coverts
External calamus mite: <i>Mesoknemidokoptes laevis</i>	Outside wall of calamus	They min externally the calamus producing some cortical tunnels	They cause the fall of the wing feathers
Mites: <i>Cheyletidae</i> <i>Ornithocheyletia</i>	Basis of head feathers, above all around the eyes and auditory meatus	They stick the feathers with sericeous secretions	Itch. The hearing is reduced, when the mite is localized in the auditory meatus
Mites: <i>Harpyrhynchidae</i>	At the basis of perocular feathers and around the auditory meatus	They lay their eggs on the barbs, which become yellowish	Severe itch

each other, without cutting the barbs completely.

Other insects, instead, less known under this aspect than *Mallophaga*, are the *Coleoptera* of family *Dermestidae*, *Dermestes* genus. Those insects are able to attack the alive animals' plumage, if the feathers are dirty of faeces or of feedstuff. This occurs frequently, for instance, in intensive pheasant farms, where the animals are often kept to sleep on the ground, even near carcasses of new-born pullets or close to broken eggs. Those materials attract *Coleoptera* adults and larvae of *Dermestes* genus, that, by their masticatory mouth, stronger and bigger than *Mallophaga*'s one, can break sleeping animals' feather barbs, by clenching them in groups. This determines a typical bend in the place of the cut, which is the differential element in comparison with lesions caused by *Mallophaga*. Besides the *Dermestidae* can break the rachis of smaller feathers and inlay the one of the bigger feathers. Typical lesion caused by *Dermestidae* beetles is the one at the level of pheasants'tail, which, under the action of *Dermestidae* at the end breaks with a consequent depreciation of the birds.

Among the mites, a distinction is to be made between those localizing in the feather vane and those localizing at the level of calamus. Among the formers are *Astigmata* mites, belonging to the suborder *Psoroptidia* with many families, such as *Pterolichidae*, *Analgidae*, *Proctophyllodidae*, *Dermoglyphidae* and others. Many species of those families live on barbs, near the rachis in the internal part of feathers, often at the level of primaries (the localization varies depending on the species). All these mites cannot cut the barbs, but can shift or cut off the barbules, producing small holes hardly visible if the feather is held up against the light. The holes are very small and scattered and in this they are different from those caused by young *Mallophaga* that, generally, producing holes on the same line. The second group of mites we observed localizes, instead, at the level of feather calamus. They belong either to *Actinedida*, prostigmates of the suborder *Eleutherengona*, family *Syringophilidae*, either to the above mentioned order of *Astigmata* *Psoroptidia*, family *Knemidokoptidae*. Mites of family *Syringophilidae* localize in the internal part of calamus of feathers, whereas

Mesoknemidokoptes laevis, a species of family *Knemidokoptidae*, mines externally the calamus by producing some cortical tunnels.

Both of them, but mainly the mites of family *Syringophilidae*, cause the inflammation of feather papilla and its consequent fall. There can be itch and the animal can tear it by itself.

Finally, we observed another group of mites localizing at the basis of feathers and among the barbs. They are Prostigmata mites belonging to the suborder *Eleutherengona*, of the family *Cheyletidae*. Eggs of this mite are kept inside silky cobwebs spun from substance secreted by female mites. Feathers appear sticky and barbs are attached like a web. Mites belonging to the suborder *Eleutherengona*, family *Harpyrhynchidae*, lay their eggs on the barbs at the basis of feathers, above all the periocular ones and around the auditory meatus in *Passeriformes*. In this case the feather has a typical look and white-orange colour.

Conclusions

The main lesions by arthropods to feathers are certainly those caused by *Mallophaga* (Atyeo *et al.*, 1966; Post, 1981; Wheeler *et al.*, 1989) whereas those caused by typical mites of the feathers (*Astigmata* mites of the suborder *Psoroptidia*) are less evident. In *Passeriformes* lesions to feathers by *Harpyrhynchus* and *Syringophilus* are frequently recorded (Clark, 1964; Principato *et al.*, 1992, 1995). Lesions caused by *Ornithochyletia* and *Mesoknemidokoptes* result to be more rare (Krantz, 1978; Principato *et al.*, 1987, 1995). On the contrary it is frequent to observe the attack of plumage by *Dermestidae*, but it is caused by the presence of organic rests and poor hygiene of the farms (Théodoridèd, 1949). A differential diagnosis may be easy if one takes into account not only the morphology of lesions, but also their place and the host's species.

A treatment with parasiticides is not always successful, as it is in the case of Syringophilosis, and anyhow a possible treatment must be necessarily carried out considering the role of the environment as well (for instance: *Dermestidae* or contagion with feathers fallen on the ground) in the upset of the pathology.

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