The Influence of Various Moulds on the Multiplication of Some Mycophagous Mites

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SUMMARY

The aflatoxins of *Aspergillus flavus* are very toxic for mycophagous mites *Glyciphagus* and less toxic for *Histiostoma*. Some *Penicillium* species producing mycotoxins were not favourable for the multiplication of *Glyciphagus*, but other moulds such as *Penicillium roqueforti* were suitable.

INTRODUCTION

It is known that some species of moulds produce a series of substances known as mycotoxins, harmful to different animals (Wogan, 1964) and to some plants. Among these, the aflatoxins are considered to be amongst the strongest of biological poisons; they are produced by *Aspergillus flavus* (Hesseltine, Shotwell, Ellis & Stubblefield, 1966) and by some *Penicillium* strains (Hodges *et al.* 1964).

In our previous research on the mould flora of raw and smoked salami we found that the normal mould layer was consumed by some species of mycophagous mites (Racovitza & Racovitza, 1968). This raised the question whether mycophagous mites are sensitive to mycotoxins and especially to aflatoxins.

METHODS

An aqueous suspension of mould spores (obtained in pure culture) was inoculated on Czapek-medium in test-tubes, so that the whole surface was evenly covered. The excess liquid was drained off to prevent the mites getting drowned. The tubes were kept in the laboratory for 3 to 4 days till the beginning of the sporulation. At that time a known number of adult mites, male and female, were introduced into each tube on the pointed end of the thin glass rod and shaken on the upper side of the culture. The tubes were then kept in a cool place in the laboratory for 23 to 70 days.

The tubes were divided by 4 to 5 rings with a diamond and each area was examined separately under a lens to observe the multiplication of the mites. The living larvae, nymphs, adults and hypopi (resistant stage) were counted separately. Then the medium was removed from each ring and examined under the binocular microscope to count the mites on the media as well as those on the glass. The end of the cotton-wool plug was carded with a needle over black paper and all the mites shaken out counted with a lens.

The influence on mite multiplication of *Aspergillus flavus* Link, *Penicillium commune* Thom, *P. cyclopium* Westling, *P. expansum* Lk., *P. roqueforti* and *P. viridicatum* Westling was examined on *Glyciphagus domesticus* de Geer and a *Histiostoma* sp. (fam. Tyroglyphidae).

The *Aspergillus flavus* strain was isolated from soil and was found positive for aflatoxin by tests on day-old ducklings (Racovitza, Racovitza & Constantinescu, 1969). The other species were isolated from salami surface.

RESULTS

The results showing the influence of the moulds on the multiplication of the Glyciphagus mite are seen in Table 1. In four experiments totalling 128 mites, the cultures of *Aspergillus flavus* were extremely toxic for this mite, which died shortly after feeding. After 23 days, only 2/10 were left and after 47 to 50 days all were dead. It was noticed that, although the females laid their eggs, the neonate larvae died.

Table 1. *Influence of various moulds on the multiplication of the mite Glyciphagus domesticus*

Experiment	Temperature	Mould	No. of tubes	Initial no. of mites in each tube	Time (days)	Average no. of living mites	
						Larvae	Adult hypopi
1	18-28°	<i>A. flavus</i>	1	10	23	0	2
		<i>P. roqueforti</i>	1	10	23	0	16
		<i>P. expansum</i>	1	10	23	0	8
2	18-21°	<i>A. flavus</i>	4	12	50	0	0
		<i>P. roqueforti</i>	1	12	50	283	2
3	18-21°	<i>A. flavus</i>	1	10	47	0	0
		<i>P. expansum</i>	1	10	47	148	2
4	18-21°	<i>A. flavus</i>	6	10	42	0	0.3
5	14-22°	<i>P. commune</i>	3	10	50	91	35
		<i>P. cyclopium</i>	3	10	50	91	9
		<i>P. expansum</i>	3	10	50	108	14
		<i>P. viridicatum</i>	3	10	50	32	5

Table 2. *Influence of Aspergillus flavus and Penicillium roqueforti on the multiplication of the mite Histiotoma sp.*

Experiment	Temperature	Mould	No. of tubes	Initial no. of mites in each tube	Times (days)	Average no. of living mites
1	18-21°	<i>A. flavus</i>	4	5	70	71.5
		<i>P. roqueforti</i>	3	5	70	745.3
2	18-21°	<i>A. flavus</i>	10	10	42	86

In the experiment with *Penicillium roqueforti*, 10 mites increased to 16 after 23 days; no hypopus stage was found. In a second 50-day experiment, 12 mites grew to two nymphs and 283 hypopi.

Experiment 1 with *Penicillium expansum* showed no multiplication in 23 days, but in Expts. 3 and 5 the initial number of 10 increased, after 50 days, to 136 individuals, an increase of 13.6-fold.

The initial number of 10 increased to 126 (12.6-fold) on *Penicillium commune*; 10 to 100 (10-fold) on *Penicillium cyclopium*, and 10 to 37 (3.7-fold) on *Penicillium viridicatum*.

Table 2 shows the influence of *Aspergillus flavus* and *Penicillium roqueforti* on the multiplication of a *Histiostoma* sp. mite.

CONCLUSIONS

From these preliminary results, the following conclusions may be drawn:

The *Aspergillus flavus* strain which produces aflatoxin is extremely toxic for *Glyciphagus domesticus*, though less toxic for *Histiostoma* sp. Therefore within this group of Arthropoda there are differences in resistance to aflatoxins.

Penicillium viridicatum, which produces a toxin, viridicatine (Wogan, 1964), and *P. commune*, which produces a toxin causing gastrointestinal disturbances to animals (Wogan, 1964), were both toxic to *Glyciphagus domesticus*, as was *P. cyclopium*, which probably produced a toxin.

Penicillium expansum and *P. roqueforti* did not appear to produce toxins and were suitable moulds for the growth and multiplication of the mites.

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