DIFFERENCES IN ZEARELENONE PRODUCTION BY FUSARIUM EQUISETI STRAINS IN VITRO AND IN FRUITS

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Fusarium equiseti has frequently been recorded on cereals, including maize, wheat and barley (1). The fungus is widely reported to be toxigenic, producing a range of mycotoxins including trichothecenes, mycotoxins and zearalenone, and it has been associated with various experimental animal diseases (2). The aim of this work was to determine the ability of different strains to produce zearalenone and to study the effect of the environmental conditions on toxin formation.

Eight isolates of F. equiseti were used: 160825 (=25), 174460 (=460) and 174461 (=461), received from the CMI; 28805 (=805) and 46469 (=469), received from the ATCC; and 6469 (=69), 6470 (=70) and 6471 (=71), received from the NRRL. Zearalenone production was investigated on potato dextrose agar (PDA), Czapek's medium, corn grain, tomato, melon and avocado.

Only strains No. 69, 70 and 71 produced zearalenone. The amounts of zearalenone produced on Czapek's medium were lower than those on PDA (2.0 vs 6.0 mg/60 ml medium). Only low amounts of toxin were produced when the fungus (isolate No. 70) was grown on Czapek's medium supplemented with lactose (Table 1).

Table 1 - Fungal growth and zearalenone production in the presence of various sugars added to Czapek's medium at $4 \cdot 10^{-1}$ M.

Sugar	DW (g/plate)	Toxin (mg/60 ml)
Sucrose	0.60	4.0
Lactose	0.52	0.02
Xylose	0.53	6.0

The sulphur-containing amino acids methionine (10^{-3} M) and cystine (10^{-2} M) were the only amino acids which prevented zearalenone production; none of the acids prevented fungal growth.

Of the various fruits tested, avocado accumulated the highest amounts of toxin (Table 2).

Table 2 - Accumulation of zearalenone in various fruits.

Fruit	Zearalenone production (mg/40g)
Tomato	0.05
Avocado	3.5
Melon	0.2
Banana	0.05

Corn grains sterilized by gamma irradiation at 1000 krad were used for the modified atmosphere (MA) studies. The grains were inoculated with a spore suspension of isolate No. 70, and incubated under MA conditions for 15 days at 26°C. Fungus growth was considerably reduced under 40% CO₂/5% O₂. However, zearalenone production was inhibited under all the CO₂/O₂ combinations tested (Table 3).

Table 3 - Fungal growth and zearalenone production in corn (100% infested grains) kept under modified atmospheres.

CO ₂ /O ₂ (%)	Corn moisture content (%)	CFU/g (x10 ⁸)	CO ₂ accumulation (%/25 g/24 h)	Zearalenone (mg/50 g)
Air	26.4	2.4	31.2	20.0
20/20	27.2	1.7	23.9	4.0
60/20	26.07	1.2	26.9	trace
20/5	25.6	0.9	17.4	7.0
40/5	26.2	0.4	15.9	trace

The strains of *F. equiseti* tested differ greatly in their ability to produce zearalenone on synthetic medium. Certain sugars as well as S-containing amino acids do not support zearalenone production, although fungus growth is not retarded. Toxin formation on moist corn grain can be reduced markedly by enriching the atmosphere with CO₂. However, the levels needed to inhibit toxin formation are much lower than those needed to inhibit fungus growth.

REFERENCES

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