

Effect of Initial pH on Aflatoxin Production

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The effect of initial pH on aflatoxin production by *Aspergillus parasiticus* NRRL 2999 was examined in a semisynthetic medium. Maximal growth, aflatoxin production, and aflatoxin production per unit of growth occurred at initial pH levels of 5.0, 6.0, and 7.0, respectively. Initial pH levels <pH 6.0 favored production of the B toxins, whereas levels >pH 6.0 favored production of the G toxins.

Various investigators (1-4; R. L. Buchanan, Jr., and J. C. Ayres, *J. Food Sci.*, in press) have examined the effect of initial pH on the production of aflatoxin, but these investigations were limited to the determination of B₁ and G₁ toxins or total aflatoxin production. The objective of the present study was to determine the effect of initial pH on the relative production of aflatoxins B₁, B₂, G₁, and G₂ in a semisynthetic medium.

AMY medium (Buchanan and Ayres, in press) was prepared and adjusted to the desired pH level using 12 N HCl and 1 N NaOH. The medium was transferred in 25-ml aliquots to 125-ml Erlenmeyer flasks and autoclaved for 15 min at 15 lb/in². The pH of the medium was

aflatoxins were extracted and quantitated according to techniques previously reported (Buchanan and Ayres, in press). Growth was estimated by mycelial dry weight. All pH levels were examined in triplicate on two separate occasions for a total of six determinations per pH.

The effect of initial pH on growth and aflatoxin production in AMY medium is summarized in Table 1. Maximal growth occurred at an initial pH of 5.0. However, the mold grew well over the entire pH range. Maximal aflatoxin production and aflatoxin production per unit of growth occurred at initial pH levels of 6.0 and 7.0, respectively. The initial pH levels at either extreme of the test range were rela-

TABLE 1. Effect of initial pH on growth and aflatoxin production by *A. parasiticus* NRRL 2999 incubated in AMY medium for 7 days at 38 C

pH		Mycelium (mg)	B ₁ + B ₂ + G ₁ + G ₂ /25 ml (μg)	B ₁ + B ₂ G ₁ + G ₂ /mycelium (μg/mg)	Individual toxins (%)				Ratio	
Initial	Final				B ₁	B ₂	G ₁	G ₂	B ₂ /B ₁	G ₂ /G ₁
3.0	2.2	710	666	0.95	58.2	13.8	24.4	3.6	0.23	0.15
4.0	2.7	777	2,958	3.87	66.5	5.4	26.2	2.1	0.07	0.08
4.5	3.4	793	3,895	4.96	60.9	5.3	32.1	2.2	0.09	0.07
5.0	4.4	885	4,592	5.25	57.9	5.5	39.2	2.5	0.09	0.07
5.5	5.0	816	5,568	6.81	54.9	3.7	37.8	2.8	0.07	0.07
6.0	4.8	796	5,883	7.39	48.1	3.5	45.4	3.1	0.07	0.07
7.0	6.2	634	5,098	8.21	27.7	1.3	67.4	3.6	0.05	0.04
8.0	6.4	591	3,690	6.05	22.8	1.1	72.5	3.6	0.05	0.05

checked after sterilization to insure that there was no change. The flasks were inoculated with *Aspergillus parasiticus* NRRL 2999 using 1.0 ml of a suspension containing 10⁶ spores/ml. After preliminary studies indicated that there was little change in growth and aflatoxin production after 7 days, all cultures were incubated without agitation for 7 days at 28 C. The

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tively inhibitory to aflatoxin production. Initial pH levels below 6.0 favored production of the B toxins, whereas initial pH levels above 6.0 favored production of the G toxins. An initial pH of 3.0 appeared to stimulate the production of B₂ and G₂, whereas initial pH levels of 7.0 and 8.0 depressed B₂ production. The increase in the relative amount of B₂ and G₂ in the pH 3.0 cultures may reflect a decrease in B₁ and G₁ due to their conversion to B_{2a} and

G_{2a}, respectively. Within initial pH groups, the ratios of B₂ to B₁ and G₂ to G₁ were similar.

Lie and Marth (3) reported that when a casein substrate was used maximum aflatoxin production occurred at both acidic and alkaline pH extremes. Joffe and Lisker (2) demonstrated greater aflatoxin accumulation in Czapek liquid medium at an initial pH of 4.0 than at pH 7.0. Similarly, Reddy et al. (4) reported that pH 4.5 produced optimal aflatoxin accumulation in SL medium. Davis et al. (1) found that initial pH had no effect on aflatoxin production in YES medium. These results, together with those in the present study, indicate that initial pH has no universal effect on aflatoxin production. Apparently the effect of pH is dependent on the composition of the medium employed for growth of the mold; the initial pH for optimal aflatoxin production must be determined for each medium. Determination of the factors influencing the effect of initial pH on the total and relative

production of aflatoxins warrants further research.

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