Colonization of Aerial Peanut Pegs by Aspergillus flavus and A. niger-Group Fungi Under Field Conditions

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ABSTRACT

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Selective media were used to isolate *Aspergillus flavus* and fungi of the *A. niger* group from aerial peanut pegs (elongating tissue at the base of developing fruit) in the field during 1973, 1974, and 1975 and from peanut flowers in 1974 and 1975. *Aspergillus flavus* was isolated from about 7% of washed peanut flowers in both years, but isolation frequency from terminal portions of washed aerial pegs and surface-sterilized aerial pegs over the same period was lower (1.5% and 0.3%, respectively). In 1973, *A. flavus* was isolated from 0.2% of surface-sterilized aerial pegs. Isolation frequency of antagonists of *A. flavus* in the *A. niger* group was lower than *A. flavus* on flowers and similar on aerial pegs. Low levels of colonization of peanut fruits by *A. flavus* via flower and aerial peg colonization appears to be possible under Virginia field conditions.

Additional key words: Arachis hypogaea, groundnut, mycotoxins.

Aflatoxin contamination of peanut (*Arachis hypogaea* L.) seeds due to colonization by *Aspergillus flavus* Link ex Fries and *A. parasiticus* Speare is of prime concern to the peanut industry. Conidia of *A. flavus* in soil may be induced to germinate adjacent to developing peanut fruits, particularly following injury of the fruits (3). Colonization of the peanut fruit by *A. flavus* may follow. Recently, Wells and Kreutzer (10) suggested that *A. flavus* may colonize peanut flowers nonpathogenically during the blossom period and remain associated with the apparently sound, developing peanut pod tissue until harvest. This hypothesis was based on gnotobiotic experiments in which axenic peanut flowers were inoculated with conidia of *A. flavus,* and the fungus subsequently was isolated from pegs (elongating tissue at the base of developing fruit) developing from inoculated flowers. At present, there are no field data on *A. flavus* colonization of peanut flowers, and insufficient data on aerial peanut peg colonization. Griffin (3) observed that *A. flavus* conidia germinated on aerial pegs, and Hanlin (5) reported colonization of aerial pegs by the *A. flavus* group in one of two field samplings. The present study was undertaken to determine the extent of *A. flavus* colonization of aerial peanut pegs under field conditions. Isolation frequency of *A. flavus* antagonists in the *A. niger* group (1, 6) also was determined. In the later part of the study, flower colonization was determined.

MATERIALS AND METHODS

Aerial peanut pegs and flowers were collected on 27 August 1974 from cultivar NC 17 plants, and on 29 August and 1 September 1975 from cultivar Florigiant plants growing at the Tidewater Research and Continuing Education Center, Holland Station, Virginia. Only aerial pegs were collected from Florigiant plants in 1973 (on 27 and 28 August). In 1973, pegs were surface-sterilized in 0.5% NaClO for 3 minutes before they were plated on rose bengal streptomycin agar (7). Plates were incubated for 4 days at 27 C. In 1974 and 1975, pegs were washed for 3 hours in (a) running tap water only or (b) running tap water followed by surface sterilization for 3 minutes in 0.5% NaClO and a sterile water rinse. Because of their delicate nature, flowers were washed in tap water only for a 3-hour period. Following these treatments, flowers and apical portions of pegs (about 2 cm long) were plated on a selective medium for *A. flavus* and fungi in the *A. niger* group (4). Plates were held for 3 to 6 days at 35 C.

RESULTS AND DISCUSSION

Aspergillus flavus was isolated from approximately 7% of washed peanut flowers in both 1974 and 1975 (Table 1). However, the frequency of isolation of *A. flavus* from aerial pegs for both these years was lower. Isolation from surface-sterilized pegs was lowest of all. The frequency of isolation of *A. flavus* from peanut peg tissues was remarkably similar for 1973, 1974, and 1975. The results suggest that *A. flavus* does not always establish a

TABLE 1. Frequency of isolation of *Aspergillus flavus* and members of the *A. niger*-group fungi from peanut flowers and aerial peanut pegs (elongating tissue at base of developing fruit) under field conditions in 1973, 1974, and 1975

Plant parts		Number of plant parts tested	*A. flavus* (%)	*A. niger* group (%)
Washed flowers	1974	68	7.4	2.9
	1975	205	6.6	2.3
	Mean		7.0	2.6
Washed aerial pegs	1974	720	1.2	2.8
	1975	705	1.8	0.4
	Mean		1.5	1.6
Surface-sterilized aerial pegs	1973	1,500	0.2	0.1
	1974	740	0.3	0.4
	1975	725	0.3	0.8
	Mean		0.3	0.4

successful systemic infection following flower inoculation. In addition, the reduction in numbers of successful isolations from surface-sterilized tissues suggests that some of the *A. flavus* propagules associated with peanut pegs either are located on the surface or in the outermost cell layers. Pegs are delicate tissues, and it is possible that NaClO penetrated several cell layers of the pegs. The results support the hypothesis of Wells and Kreutzer (10) that *A. flavus* can become associated with the peanut fruit early in its development. However, the level of colonization appears to be lower than the *A. flavus* colonization percentages (about 1 to 5%) reported by Garren and Porter (2, 8, 9) for harvested peanut fruits. Their studies were conducted in the same fields from which tissue samples were taken for the present studies. In addition, Griffin (3) observed much higher levels of *A. flavus* conidial germination in soil adjacent to injured peanut fruits than on aerial peanut pegs.

Hanlin (5) reported that 6% of surface-sterilized aerial peanut pegs of cultivar Argentine were colonized by *A. flavus*-group fungi in one sampling (100 pegs/sample) and 0% in a second sampling. Other *Aspergillus* spp. also were isolated, but no indication of colonization by the *A. niger* group was given. In the present study, *A. niger*-group fungi were isolated from flowers at a lower frequency than *A. flavus*, but the frequency of isolation of members of the *A. niger* group from peg tissues was about the same as for *A. flavus*. In contrast, Garren and Porter (2, 8, 9) isolated *A. flavus* from peanut fruits more frequently than members of the *A. niger* group. Ashworth et al. (1) found that *A. flavus* was a better competitor than *A. niger* during colonization of peanut fruit.

Inoculation of peanut flowers by *A. flavus* may result from the splashing of infested soil on flowers during rains or from aerial dissemination of dry conidia. In preliminary tests designed to evaluate the relative importance of each, 30 open petri plates containing the selective medium for *A. flavus* and the *A. niger* group were placed in a perpendicular position against the stems of peanut plants in the field for 3 days. Ten of the plates were removed from the field each day, and incubated at 35 C. No *A. flavus* colonies developed on plates removed after the first 2 days. However, several *A. flavus* colonies developed on the petri plates which were removed after the 3rd day, following a hard rain that splashed soil upon the surface of the agar medium.

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