the scarp forming coarse glauconitic sandstone, on the right bank is assumed by us to represent the top of the Mahadek Sandstone. Following this, the exposure gap further down stream and the succession of calcareous shale and marl with thin sandy intercalations was grouped by us within the Langpar based on the best possible and objective lithologic criteria. Incidentally, the gap zone is now exposed in a newly cut road section. From the map of the river section and computed profile given by Pandey[2] (figure 1 of his paper) it is observed that these calcargillaceous sediments up to about 50 m thickness have been included within their "Mahadeo" Formation. Our K/T contact falling within the Langpar Formation is about 30 m (60 m map distance) above their K/T contact and is located at about 69 m (138 m map distance) above the last exposure of the Mahadek Sandstone on the right bank of the river.

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INCIDENCE OF TOXIGENIC *ASPERGILLUS FLAVUS* IN MARKETED EDIBLE VEGETABLE OILS

SEEMA SARNAIK, S. H. GODBOLE and PRADNYA KANEKAR

Maharashtra Association for the Cultivation of Science Research Institute, Law College Road, Pune 411 004, India

THE pods of groundnut mature beneath the surface of the soil and at maturity the whole plant is harvested. Groundnut pods are many a time infested by soil fungi especially belonging to *Aspergillus flavus*[1,2]. Ability of the isolates of *A. flavus* to produce aflatoxins in groundnut and in a nutrient medium has been reported[1]. The presence of aflatoxin in unrefined oil has also been reported[3-5]. No information is, however, available on the presence of *A. flavus* in groundnut oil. This paper reports the incidence of *A. flavus* in marketed vegetable oils and the inability of the toxigenic strains to produce aflatoxin in groundnut oil.

Twenty-six oil samples comprising of 12 unrefined, seven refined groundnut oil and seven oil samples from ration shop were collected in sterile containers from the local market and processed immediately for microbiological analysis.

Isolation of A. flavus

A. flavus was isolated using *Aspergillus* differential medium[6]. An aliquot of 0.1 ml of suitable dilution of 1% emulsion of oil in quarterstrength Ringer's solution containing 0.1% agar[7] was mixed with the medium and pour plate method was used. The plates were incubated at room temperature for 96 h and the isolates were identified by studying morphological characteristics according to Barnett[8].

Ability of the A. flavus isolates to produce aflatoxin

Ability of the isolates of *A. flavus* to produce aflatoxin in nutrient medium was studied according to the method of Borker *et al*[9]. The isolates were also inoculated in 4 sets of one kg sterile groundnut oil and incubated at room temperature for three months. A pair of inoculated and uninoculated flasks were examined for the evidence of aflatoxin production by the method of Pons *et al*[10], immediately after inoculation and also at monthly intervals during incubation.

The data on incidence of *A. flavus* and the toxigenic *A. flavus* in the oil samples are given in table 1 which shows that of the 26 samples exa-

Table 1 *Incidence of Aspergillus flavus and toxigenic A flavus in different oil samples*

Oil samples examined		Oil samples showing presence of	
Type	Number	*A flavus*	Toxigenic *A flavus*
Unrefined groundnut	12	3 (25.00)	2 (16.67)
Refined groundnut	7	0	0
Ration	7	3 (42.85)	3 (42.85)
Total	26	6 (23.08)	5 (19.23)

Figures in parantheses indicate the percentage.

mined, six samples harboured *A. flavus* and five of these were toxigenic. Among the 12 unrefined groundnut oil samples examined, two samples and of the seven ration oil samples examined three samples, had toxigenic *A. flavus*. All the seven refined oil samples were free from *A. flavus*.

Such incidence of *A. flavus* in unrefined groundnut and ration oil samples which are consumed by a large section of community was alarming and indicated that oil-seeds infested with *A. flavus* were used for extraction of the oil. Thus, oils could become carrier of *A. flavus* and hence hazardous. Since no aseptic precautions are followed during the extraction of oil from oil-seeds, the presence of *A. flavus* in unrefined groundnut and ration oil samples, thus indicated the origin of the fungus through infested oil-seeds. Absence of *A. flavus* in the refined oil samples indicated that the process of refining eliminates *A. flavus* and makes it safe for the consumption. The present investigation thus suggests that the oil-seeds should be treated to eliminate microorganisms including *A. flavus*.

When the ability of the isolates to produce aflatoxin in sterile groundnut oil was tested, the results showed that the strain did not produce any aflatoxin in sterile groundnut oil over a period of three months. The fact that the strain produced aflatoxin B_1 in nutrient medium, but not in groundnut oil indicated the requirement of sufficient moisture and nutrients for growth and toxin production. Oil alone does not satisfy these requirements and hence the organism could not produce aflatoxin in oil. Thus, it is the oil-seed which produces the aflatoxin and hence it should be suitably treated.

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CYTOPLASMIC VESICLES CONTAINING SECONDARY METABOLITES IN THE ROOT OF *COLEUS FORSKOHLII* (WILLD.) BRIQ.

Z. ABRAHAM, A. K. SRIVASTAVA and G. D. BAGCHI

Botany and Pharmacognosy Division, Central Institute of Medicinal and Aromatic Plants, R.S.M. Nagar, Lucknow 226 016, India.

COLEUS FORSKOHLII (Willd.) Briq. Syn. *C. barbatus* (Andr.) Benth. (Lamiaceae) is a perennial aromatic herb, growing wild from Simla eastwards to Nepal, in the hills of Bihar, Gujarat and peninsular India (600–2500 m). It is common on dry barren hills and is cultivated in Maharashtra and Gujarat for edible roots, which are often used as pickles[1]. Recently, biologically active terpenoids were isolated from the roots[2–7]. The plant is valued for its hypotensive activity, the chief active principle being forskolin/coleonol[8,9]. Forskolin also acts as bronchodilator[10,11], stimulates adenylate cyclase activity[12,13], and acid and pepsinogen secretion by gastric glands[14]. Both these compounds (forskolin/coleonol) are identical in nature[15]. Other terpenoids, barbatusin and cyclobutatusin are found to be active against mouse Ehrlich ascites tumour cells[7].

The terpenoids are found in almost all the parts of the plant but roots are the main source[3]. Forskolin is present in amounts of ca 0.05% of the dry weight of the whole plant and ca. 0.1% of the dry weight of the roots[16]. The present study has been undertaken to localize the part of root wherein the terpenoids and other metabolites are stored.

Plants collected from Kuridimalai, Tamil Nadu (4514) and Marayur, Kerala (4773) were grown in the glass house/farm of the Central Institute of Medicinal and Aromatic Plants, Lucknow. Free hand sections of fresh roots were cut and observed. Photographs were taken with the help of Optiphot-pol-camera attached light microscope.