sterilized twigs of lucerne plant and incubated at 27° C for two months.

The pathogenicity of the organism was established by using 6-day-old inoculum from potato-dextrose-agar on young seedlings. Typical symptoms appeared on the leaflets after 48 hours at 95% relative humidity. Reisolation from such lesions yielded *C. scoparium*.

C. scoparium has been reported on *Ficus carica* L. (Mehta and Bose[2]), *Cajanus cajan* (L.) Millsp. (Aginhothrudu[1]), *Madhuca butyracea* (Roxb.) Macb. (= M. *indica* J. F. Gmel.) (Nirwan and Singh[3]), and *Eucalyptus macarthuri* Deane and Maiden (Pandotra, *et al.*[4]) in India.

This is, therefore, the first record of *C. scoparium* inciting leaf-spot and stalk blight of lucerne in India. The fungus grown on sterilized stem bits has been deposited in Herbarium of Agricultural College, Hebbal, as MYSP # 1985.

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RHIZOSPHERE, PHYLLOSPHERE AND GEOCARPOSPHERE STUDY OF APPARENTLY HEALTHY AND VIRUS-INFECTED GROUNDNUT PLANT

GROUNDNUT crop is generally observed to be affected with virus. As no account of rhizosphere, phyllosphere and geocarposphere microflora composition and association of useful micro-organisms with virus-infected groundnut plant has been given from this country, the present study was undertaken.

Composite samples of rhizosphere and geocarposphere soils and mature leaves from healthy and virus-infected groundnut plants at pod development stage (grown in the Biology Department) were analysed for total bacteria, *Azotobacter* and fungi by methods described by Agnihothrudu[3] Chouhan and Raina[5] and Prasad and Edward[10] respectively. The culture media used for growing of total bacteria *Azotobacter* and fungi were Thornton's (Allen and Allen[2]); Base medium '77' (Allen and Allen[2], and Czapek's Dox (Johnson *et al.*[6]), respectively. The incubation period and temperature used for growth were 4 days at ± 27° C respectively.

Predominant *Azotobacter* from the rhizosphere, phyllosphere and geocarposphere of virus-infected and uninfected healthy plants were isolated and nitrogen fixing potentiality estimated by Micro Kjeldahl Method as modified by Tripathi[15].

TABLE I

Average microbial population in groundnut sphere

Plant parts	Fungi 10^3		Azotobacter 10^3		Total bacteria 10^3	
	H	UH	H	UH	H	UH
Rhizosphere	45	13	141	97	1019	917
Phyllosphere	16	6	55	16	121	24
Geocarposphere	18	46	80	124	696	1940

H = Healthy plants.
UH = Unhealthy virus-infected plants.

Data furnished in Table I indicate that uninfected healthy plants of groundnut supported higher population of fungi, *Azotobacter* and total bacteria in the rhizosphere and phyllosphere over the virus-infected unhealthy plants. The increased population of healthy over diseased plants has been reported earlier in the rhizosphere (Katznelson *et al.*[7], Starkey[13], Rovira[12], and Tripathi and Edward[14]) and phyllosphere (Allen *et al.*[1]; Clark and Paul[4], Purushottam *et al.*[11]) respectively. Contrary to the observation made on rhizosphere, Lakshmikumari[8] reported increased microbial population in the rhizosphere of tobacco mosaic virus-infected plants over normally growing healthy plants. The geocarposphere of virus-infected groundnut plants registered higher population of fungi, *Azotobacter* and total bacteria over uninfected healthy plants. Further investigations to include analysis of exudations by geocarps is suggested, in this connection with the hope of finding an answer to their anomaly, as it is possible that the geocarps of virus-infected groundnut are able to liberate more and different types of nitrogenous compounds that help to promote the multiplication of *Azotobacter*.

Data from Table II shows that *Azotobacter* associated with healthy plants had higher nitrogen fixing capacity than those associated with virus-infected plants, irrespective of plant parts from which they have been isolated. This seems to indicate that *Azotobacter* associated with diseased plants have poor nitrogen fixing capacity. Presumably this was also one of the reasons that Norris and Chapman[9] had for not recommending isolation of beneficial micro-organisms from

TABLE II

Nitrogen fixing capacity of Azotobacter (mg/g mannitol) associated from different plant parts

Plant parts / Condition of plant	Rhizo-sphere	Phyllo-sphere	Geocarpo-sphere
Healthy	12·1	17·3	20·0
Virus-infected	8·6	8·6	8·9

unhealthy or diseased plants. The data in Table II also indicate that *Azotobacter* associated with geocarposphere has higher nitrogen fixing potentiality than that found in rhizosphere. This, therefore, seems to suggest clearly that different parts of the plant harbour different strains of *Azotobacter* and that geocarposphere is a potential source of desirable strains of *Azotobacter* for use as biofertilizers.

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FUNGI ASSOCIATED WITH DETERIORATING SEEDS OF *CANNABIS SATIVA* L.

THE fungi associated with seed surfaces of *Cannabis sativa* L. and those invading their deeper tissues may be of some concern to the producers and manufacturers of narcotics for medicinal purposes, as they may influence not only the quality but even the quantity of the seeds, Keeping this in mind, the present investigations were taken up.

For isolation of mycoflora, nearly 400 seeds were randomly selected from 6 months old seed lot. The techniques of seed washing and agar platings were followed as suggested by ISTA (Anonymous[1]). For agar plate methods the seed surfaces were sterilized with 0·1% $HgCl_2$. The inoculated plates were incubated for a week at 20° C. The isolates were purified following Ricker and Ricker[4] and identified with the help of stock cultures of the Department and books.[2,3,5] For determining the pathogenic nature of internally borne fungi, the seeds were soaked for few hours in spore suspension and then incubated on sterilized blotting paper at 28°C. The respective fungal spores were also sprayed on leaf surfaces of 10–15 days old plants in glass house in order to determine their pathogenicity on adult crops. In all cases, care was taken to fully satisfy the Koch's postulate; corresponding controls were also maintained for which the seeds were freed from fungi by heat therapy.

From seed washing 16 fungal species were isolated, *viz.*, *Aspergillus niger* Van Tieghem, *A. flavus* Link ex Fries, *A. tamarii* Kita, *A. Sulphureus* (Fres) Wehmer, *A. repens* (Corda) de Bary, *Penicillium chrysogenum* Thom., *Alternaria tenuis* Nees, *Alternaria geophila* Daszewska, *Fusarium javanicum* Koorders, *Curvularia lunata* (Walker) Boedijn, *Cladosporium herbarum* Persoon Link, *Monilia sitophila* Sacc, *Mycelia sterilla* Cook, *Trichoderma album* Preuss, *Cephalosporium curtipes* Sacc., Streptomyces sp.

Ten fungal species were isolated from sruface sterilized seeds, *viz.*, *Aspergillus niger*, *A. sulphureus*, *Cladosporium herbarum*, *Penicillium chrysogenum*, *P. chermesinum* Biourge, *P. frequentans* Westling, *P. lavitum* Raper and Fennell, *P. fellutanum* Biourge, *P. chrlichii* Klebahn, and *Cephalosporium curtipes*.

Five fungal species, *viz.*, *Aspergillus niger*, *A. sulphureus*, *Penicillium chrysogenum*, *Cladosporium herbarum* and *Cephalosporium curtipes* were present both externally and internally.

Out of 10 internally borne fungi only Penicillium were found to be pathogenic. The highest degree of seed spoilage was, however, exhibited by *Penicillium chrysogenum* and *P. frequentans* and the rest was moderately pathogenic. The fungi other than *Penicillium* species appear to saprophytic and probably came as a result of secondary infections. *Penicilllium*