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MYCOFLORA ASSOCIATED WITH *PARTHENIUM HYSTEROPHORUS* L.

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ABSTRACT

Parthenium hysterophorus is one of the world's noxious weed and commonly known as congress grass and carrot weed. Parthenium is fast spreading biological pollutant due to its high germination ability throughout the year, large number of seed production, high survival rate, extreme adaptability in wide range of habitats and easy dispersal of seeds. Mycobiota associated with weeds provide essential data for selection of potential biocontrol agent for weed management. Therefore, in the present study fungi associated with different parts of Parthenium were isolated and identified. Total of 35 fungal species belonging to 24 different genera were recorded from leaf, stem, flower, and seed of Parthenium. Maximum number of fungi were obtained from leaf (31) followed by seed (29), flower (25) and stem (15).
Keywords : Parthenium, Mycoflora, Biocontrol

Introduction

The annual weed Parthenium *hysterophorus* L. is native to tropical America and has now become widespread in N. America, the Caribbean, and many parts of Africa, Asia, and Australia (Navie *et al.,* 1996). It is a member of the family Asteraceae and is known for several common names like Ragweed, Parthenium, feverfew, Carrot weed, White top, Congress grass, Star weed, and vernacular names viz. Chatak Chandani, Brown brush, Gajri, Safed Topi, and Gazarghas (Krishnamurthy *et al*., 1977). It is popularly believed to have entered the Indian soil sometime during 1956 along with wheat sent by the USA under PL-480. This belief was put forth by R.S Rao (1956) based on the observation of Prof. Paranjape, who encountered this weed for the first time in 1951 growing as stray plants onto the rubbish heaps in the neighbourhood of Agricultural College, Puna (Vartak 1968). Since it has spread throughout most parts of the Indian subcontinent and is now considered to be the principal terrestrial weed in India (Dhawan *et al.,* 1993). It is one of the seven most dreaded weeds of the world (Singla, 1992). In Uttar Pradesh first reported by Ellis and Swaminathan (1969) and now has spread in all most all district of U.P.

Detrimental influence of Parthenium in agriculture, horticulture and silviculture is well documented (Agrawal and Anand 1992; Agrawal and Kohli, 1994). Parthenium causes severe human health problems such as allergy, dermatitis, eczema, black spots and blister around eyes, redness of skin, and asthma (Tower *et al*., 1977).

Manual and mechanical methods for controlling Parthenium are not effective. Conventional pesticides have long term high toxicity teratogenic, pollutive and propensity for bio- accumulation(Lydon and Duke, 1989). Biological control is considered to be economical, effective and environmentally safe. Advantages of using plant pathogen to control weed have been summarised by various workers (Mortenson, 1986; Aneja *et al.,* 1994). Fungi by causing disease, reduce rate of growth, fecundity, and general vigour of host. The objective of present study to search fungus biocontrol agent naturally occurring in Parthenium for Parthenium management.

Materials and Methods

A detailed and systematic survey of Allahabad and its adjoining areas was conducted and different parts such as leaf, stem, flower, and seed were collected and brought to laboratory for the study of mycoflora. Mycoflora were isolated by Agar plate method.

Czapek's Solution Agar or Potato Dextrose Agar medium Supplemented with an aqueous solution as an antibacterial substance was used. Fifteen ml. of the medium was poured into sterilized Petridishes. Three replicates for each sample were employed for the isolation of associated mycoflora. Plates were inoculated and incubated for 7 days at 25 ± 2 degrees Celsius. After the incubation pertidishes were examined for fungal flora.

The different Fungi were identified with the help of relevant literatures and guidance available (Raper and Fennel, 1965; Barron, 1972; Ellis, 1971, 1976; Barnett, 1960; Ainsworth and Sussman, 1973).

Result and Discussion

During investigation a total of 35 fungal species belonging to 24 genera have been recorded from different part of Parthenium (Table 1, Figure 1,2,3)

Table 1 : Mycoflora associated with different parts of Parthenium *hysterophorus*

Mycoflora	Leaf	Stem	Flower	Seed
Aspergilli				
1. *Aspergillus flavus*	+	+	+	+
2. *Aspergillus fumigatus*	+	+	+	+
3. *A. niger*	+	+	+	+
4. *A.candidus*	+	-	+	+
5. *A. ochraceus*	+	-	+	+
6. *A.terreus*	+	-	+	+
7. *A. ustus*	+	-	+	+
Ascomycotina				
8. *Chaetomium globosum*	+	+	+	+
9. *C.convolutum*	-	-	-	+
10. *Emericella nidulans*	+	-	+	+
11. *Emericella variecolor*	+	-	-	-
12. *Neosartoria fischeri var.glaber*	+	-	+	+
13. *Sordaria brevicollis var. Partheniphila var.*nov.	+	-	-	-
14. *Thielavia minor*	+	-	-	-
15. *Eurotium chevalieri*	+	-	-	+
Mucorales				
16. *Mucor racemosus*	+	+	+	+
17. *Rhizopus arrhizus*	+	+	+	+
Other Members of Deuteromycotina				
18. *Alternaria alternata*	+	+	+	+
19. *Arthrinium phaeospermum*	+	-	-	-
20. *Bipolaris tetramera*	+	+	+	+
21. *Botryosporium longibrachiatum*	-	+	-	-
22. *Cephaliophora irregularis*	-	-	-	+
23. *Cladosporium cladosporioides*	+	+	+	+
24. *Curvularia lunata*	+	+	+	+
25. *Curvularia pallescens*	+	-	-	-
26. *Drechslera hawaiiensis*	+	-	+	+
27. *Epicoccum purpurascens*	+	-	+	+
28. *Fusarium moniliforme*	+	+	+	-
29. *F. roseum*	+	+	+	+
30. *F. semitectum*	+	+	+	+
31. *Lasiodiplodia theobromae*	+	-	+	+
32. *Memnoniella echinate*	-	-	-	+
33. *Nigrospora oryzae*	+	+	+	+
34. *Paecilomyces varioti*	+	-	+	+
35. *Trichoderma viride*	+	-	+	+

+ = Present - = Absent

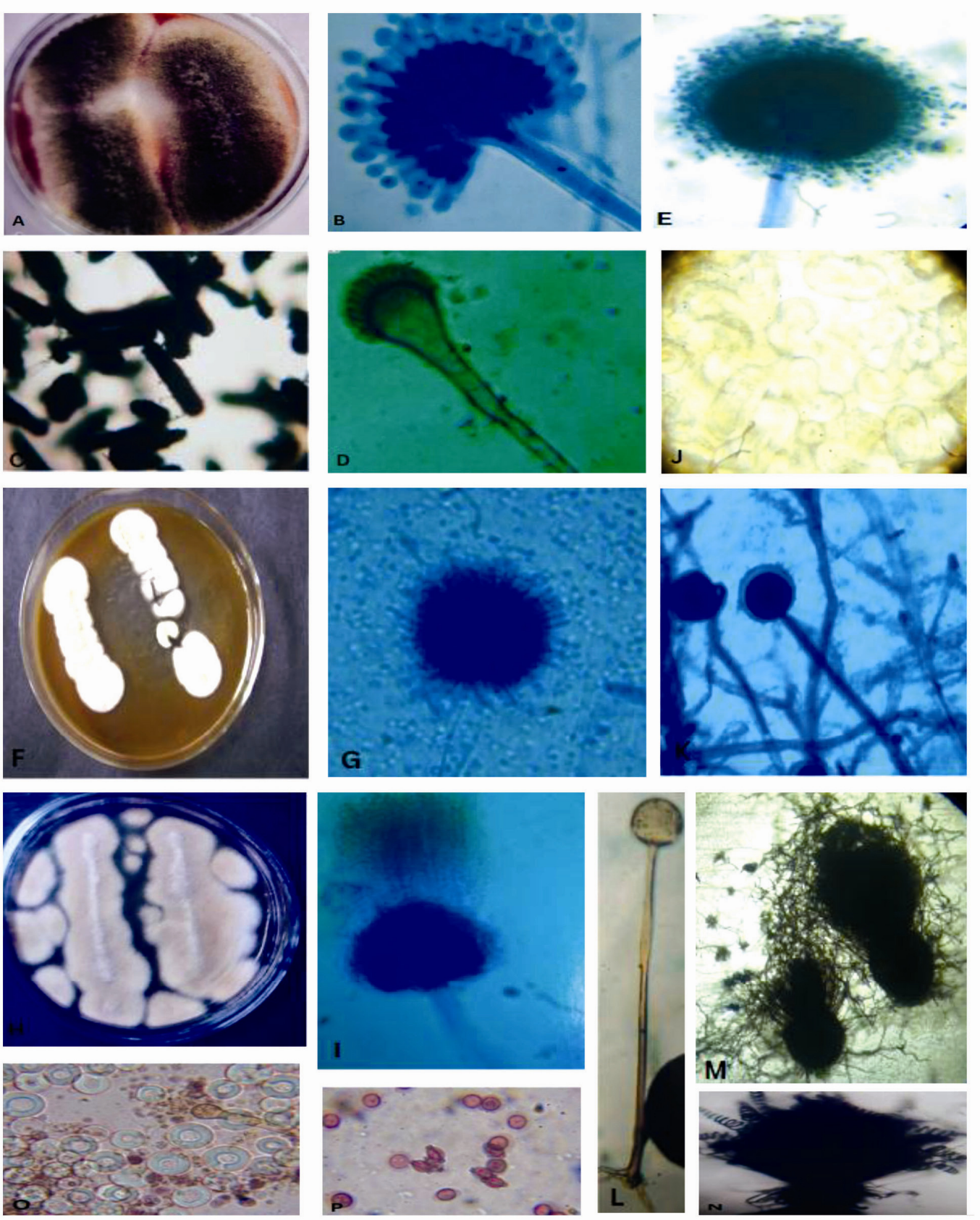

Figure 1. A-B *Aspergillus flavus*, **A** - colony**, B**-conidiophore with vesicle, biseriate sterigmata and conidia, **C-D** *Aspergillus fumigatus,* **C**- columnar conidial heads**, D-**conidiophorewith vesicle, uniseriate sterigmata**, E-***Aspergillus niger* – Conidiophore showing vesicle and conidia, **F-G** *Aspergillus candidus,* **F**- Colony, **G**- conidiophore with vesicle, biseriate sterigmata and conidia, **H-I** *Aspergillus terreus,* **H**- Colonies, **I** - conidiophore with vesicle, biseriate sterigmata and conidia, **J –***Aspergilus ustus*, Hülle cells, **K –***Mucor racemosus,* Sporangiophore with mature sporangium, **L** – *Rhizopus arrhizus*- Sporangiophore with rhizoidis and columella**, M-***Chaetomium globosum*- Mature Perithecium with undulate hairs, **N-***Chaetomiumconvolutum* perithecium with coils of terminal hairs, **O-P** *Emericella nidulans* , O- Conidiophore with conidia and Hülle cells, **P-** ascospores

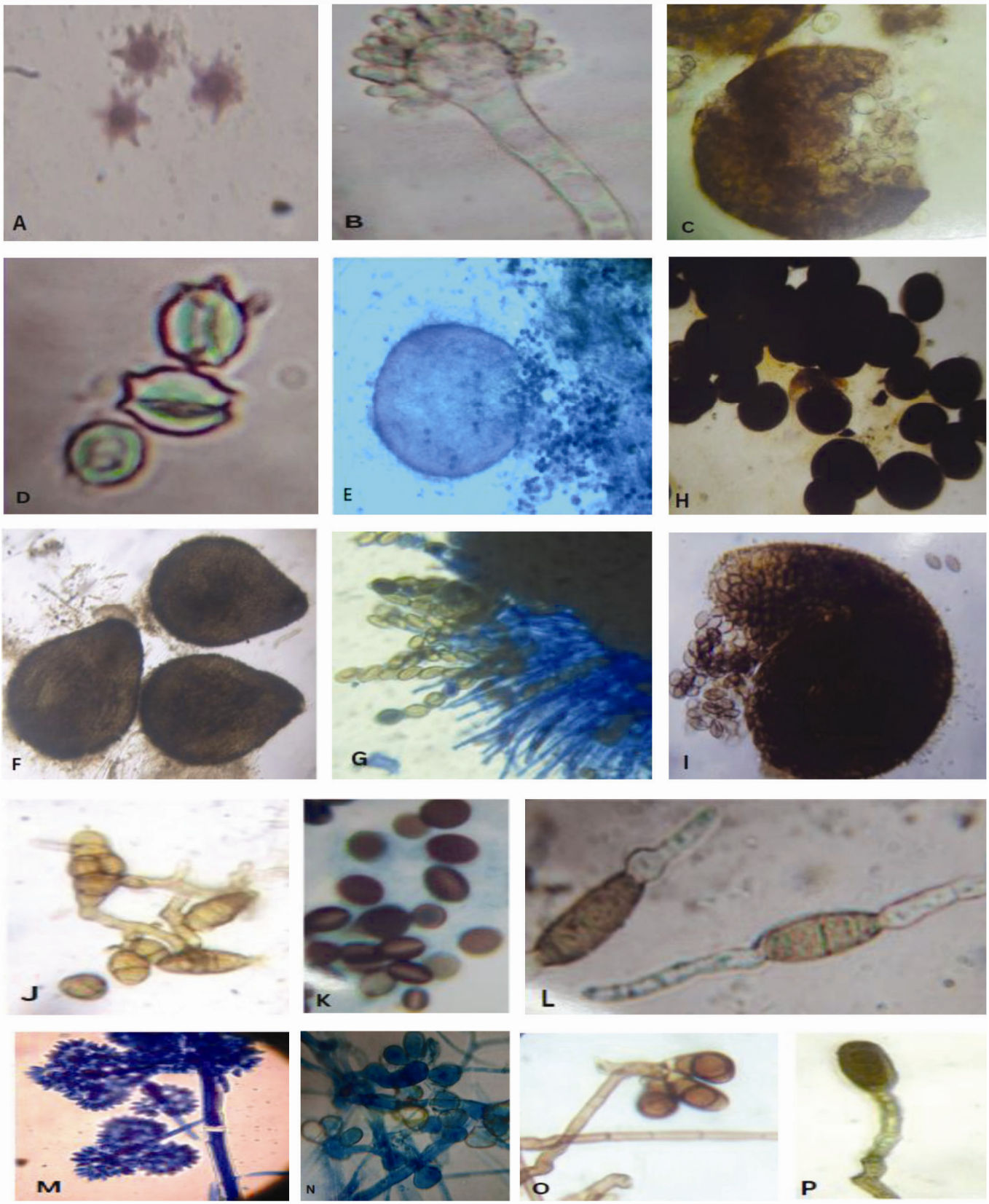

Figure 2 : A- *Emeicella variecolor,* Stellate ascospores, **B-D** *Eurotium chevalieri,* **B**- Conidiophore, vesicle, uniseriate sterigmata, **C**- Mature Cleistothecium, **D**-Ascospores with crest, **E**-*Neosartorya fischeri* var. *glaber,* ruptured Cleistothecium with Asci and ascospores, **F-G** *Sordaria brevicollis* var. *partheniphila* var.nov., **F-** mature perithecia, **G-** Ruptured Perethecium -with cylendrical asci and Ascospore, **H-I***Thielavia minor,* **H**- Mature Cleistothecia, **I-**rupturedCleistothecium showing Asci and Ascospores, **J-***Alternaria alternata* , Conidia, **K-***Arthrinium phaeospermum*, Conidia with hyaline germslit**,** **L-***Bipolaris tetramera,* Conidia with Polar germ tube, **M-***Botryosporium longibrachitum,* Conidiophore with fertile branches and conidia, **N-***Cephaliophora irregularis* , Conidiophores with conidiogenous cell and attached conidia, **O-***Curvularia lunata*, Mature conidiophore with attached conidia, **P**- *Drechslera hawaiiensis*, Conidiophore with attached conidia

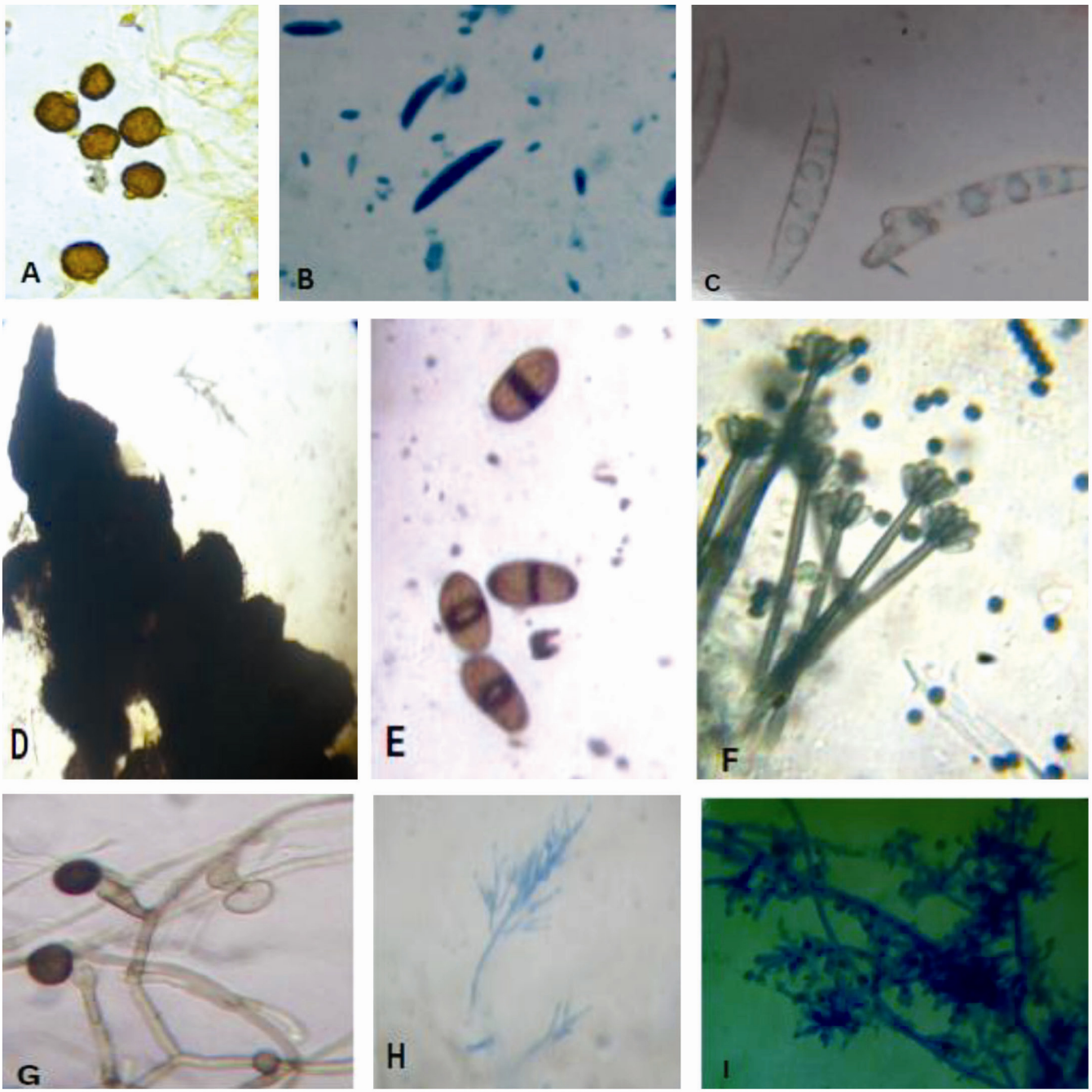

Figure 3. A- *Epicoccum purpurascens,* Mature conidia, **B**- *Fusarium moniliforme*, Micro and Macro-conidia, **C**- *Fusarium semitectum,* Macro-conidia, **D-E** *Lasiodiplodia theobromae*, **D**- Mature aggregated pycnidia, **E**- Mature bicelled conidia, **F-** *Memnoniella echniata*, Mature conidiophores with phialides and attached conidia, **G-***Nigrospora oryzae*, Mature conidiophores with attached conidia, **H**- *Paecilomyces varioti*, Conidiophore with phialides and conidia, **I**- *Trichoderma viride*, Conidiophores with phialides and attached conidia.

Out of all the Fungi 2 were of member of Mucorales, 8 of Ascomycotina, 7 of the genus *Aspergillus,* 18 of the fungi Imperfecti. Out of 8 members of Ascomycotina 4 were of the perfect stage of the genus *Aspergillus.*

From the Table (1) it is clear that maximum number of fungi were obtained from the leaf (31 species) followed by seed (29 species), flower (25 species) and stem (15 species).

Most frequently occurring fungi which were associated with almost all parts of Parthenium are *Alternaia alternata, Aspergillus flavus. A. niger, A. fumigatus, Bipolarius tetramera, Cladosprium cladosporioides, Chaetomium globosum, Curvularia lunata, Fusarium semitectutum, F. roseum, Mucor racemosus, Nigrospora oryzae, and Rhizopus arrhizus.* some of the form were uncommon and were found associated with few part of the pathenium such as *Arthrinium phaeospermum, Emericella variecolor, Sordaria brevicollis* var. *Partheniphila* var. nov. *and Thelavia minor* have been isolated from the leaf of parthenium.

Botryosporium longibrachiatum recorded only from the stem. *Cephaliophora irregularis*, *Chaetomium convolutum* and *Memnoniella echinata* had been obtained only from the seeds.

Curvularia pallescens and Eurotium chevalieri were isolated from the leaves and seeds.

Aspergillus candidus, A. ochraceus, A. terreus, A. ustus, Emericella nidulans, Neosartorya fischeri var. glaber,

Drechslera hawaiiensis, Epicoccum purpurascens, Lasiodiplodia theobromae, Paecilomyces varioti and *Trichoderma viride* were isolated from leaf, flower and seed of parthenium.

Fusarium moniliforme was isolated from leaf, stem, and flower of parthenium.

Mycoflora associated with Parthenium have been reported by some workers (Kapoor 1967; Patil and Patil 1983; Patil 1985;Rao and Rao 1987; Evans 1987; Hasija *et al*. 1989; Pandey *et al.,* 1990; Kauraw and Chile, 1999 ; Kumar and Singh 2000; Hashmi and Rashid ,2001; Taye *et al*., 2002; Bhuvaneswari *et al.,* 2008; Aggarwal *et al.*, 2014; Ahamad *et al*.,2017; Thirunarayanan *et al.,* 2021).

Fungal species viz. *Aspergillus ochraceus , A. terreus, A. ustus, Arthrinium phaeospermum Bipolaris tetramera, Botryosporium longibrachiatum, Cephaliophora irregularis, Emericella nidulans, E. variecolor, Eurotium chevalieri, Memnoniella echinata, Neosartorya fischeri var. glaber. Sordaria brevicollis var. Partheniphila* var. nov., *Thelavia minor* reported here for the first time from parthenium.

One new variety of *Sordaria brevicollis* is being reported here *S. brevicollis var. partheniphila* var. nov. on the basis of difference in size of length of perithecia, asci and ascospore. It is genetically important fungus like *Aspergillus nidulans*and *Neurospora*. *Sordaria* is a coprophilus fungus usually isolated from dung, soil and decayed vegetative material. Its occurrence from Parthenium leaf is significant.

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