

The fungus was isolated on honey peptone agar medium and pathogenicity was proved on fresh and healthy leaves. Morphology of the fungus resembles with *Isariopsis indica* with marked difference in size of conidia and synnemata¹. Therefore, a new variety, viz. *Isariopsis indica* Var. *mori* is being proposed to accommodate this fungus.

Isariopsis indica Var. *Mori* Var. *nov.*

Infection on lower surface of the leaves in the form of black colour, circular to irregular mouldy spots measuring 2-10 mm. Synnemata dark olivaceous, divergent, measuring $55.0 \times 85.0 \mu\text{m}$ (average) composed of loose conidiophores. Conidiophores erect, simple, olivaceous, in colour, bears conidia terminally and laterally, septate measuring $33.6 - 49.5 \times 8.4 \mu\text{m}$. Conidia olivaceous, 0-3 septate, cylindrical to obclavate, sometimes pyriform, measuring $21.0 - 49.5 \times 6.3 \mu\text{m}$.

The type specimen is deposited in Herb. Crypt. Ind. Oriant, IARI, New Delhi (Accession No. 33678).

Isariopsis indica Var. *more* Var. *nov.*

Infectionis maculae foliicolae, hypogenea, nigris, circularis vel irregulares, 2-10 mm diam. Synnemata fusce olivacea, divergentia $55.0 \times 85.0 \mu\text{m}$ mediet. Conidiophores recti, simplices, olivaceis, supportantes conidia singulaterminaliter et lateraliter $33.6 - 49.5 \times 8.4 \mu\text{m}$. Conidia olivaceis, 0-3 septata, cylindrica vel obclavatis, raro pyriformibus $21.0 - 29.4 \times 6.3 \mu\text{m}$.

Typus positus in Herbarium Cryptogamiae Indiae Orientatis (Accession no 33768).

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SEED MYCOFLORA OF FINGER MILLET (*ELEUSINE CORACANA*) AND ITS EFFECT ON SEED VIABILITY

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THE damage caused by fungi associated externally and/or internally with the seeds is considered to be one of the principal causes of viability loss in stored

grains¹⁻³. Finger millet or ragi (*Eleusine coracana* Gaertn.) is known to suffer from many fungal diseases and studies on its seed mycoflora⁴⁻⁶ showed that various fungi affect viability in varying degrees. In the present investigation, an attempt has been made to correlate the number of fungi associated with different varieties of ragi and the viability loss during storage.

Seeds of ten varieties of ragi viz., Purna, Annapura, Hamsa, Cauvery, H22, ROH2, HPB7-6, PR202, ECW854 and EC4840 obtained from Millet Research Station, Hebbal, Bangalore immediately after harvest were sun-dried for 12 hr and stored in new cloth bags. Since moisture percent in the stored sample is a very important factor which supports the growth of mould fungi or alters the viability even in a totally fungal free seed, the samples were frequently exposed to sunlight and stored in dry place. The moisture content in the seed at any given time was $11.2\% \pm 0.3\%$.

The agar plate method of International Seed Testing Association⁷ was used for the detection of fungi by plating 100 seeds of each variety selected at random, in 20 petri plates (15 cm diameter) containing potato dextrose agar. All the petri plates were incubated at laboratory temperature $26^\circ \pm 2^\circ \text{C}$ for 15 days to record the fungi.

Percent loss in viability was worked out with reference to percent germination immediately after harvest.

In all, 25 fungal species (table 1) were found distributed on ten varieties of ragi among which *Drechslera nodulosa*, *Aspergillus niger* and *A. flavus* were associated with all the varieties while *Drechslera tetramera*, *Curvularia lunata*, *Aspergillus clavatus*, *Fusarium* sp. and a non-sporulating one were associated with most of the varieties. The rest of the genera such as *Chaetomium*, *Alternaria*, *Phoma*, *Cladosporium*, *Rhizopus*, *Trichoderma*, *Stachybotrys*, *Nigrospora*, *Sordaria*, *Melanospora*, *Rhizoctonia* and *Penicillium* were restricted in their occurrence only with one or a few varieties.

The viability of all the varieties of ragi was tested at the end of 30 months (table 2) and the loss of viability during storage was significant (at 0.1% level). The loss of viability in different varieties ranged from 3 to 51% and the correlation between the number of fungi associated with the seeds and the total loss of viability during storage was positive and highly significant (correlation coefficient $r=0.94$).

The variation in the number and the type of fungi associated with ragi varieties has been attributed to variations in fungal population caused by variations in (a) physico-chemical nature of the seed, (b) climatic conditions of the locality under sampling, (c) agricul-

TABLE I
Fungi associated internally and/or externally with seeds of 10 varieties of ragi

Fungi isolated	Purna	Annapurna	Hamsa	Cauvery	H22	PR202	HPB7.6	ROH2	ECW854	EC4840
<i>Alternaria alternata</i>	-	-	+	-	-	+	-	-	+	-
<i>Aspergillus niger</i>	+	+	+	+	+	+	+	+	+	+
<i>A. flavus</i>	+	+	+	+	+	+	+	+	+	+
<i>A. nidulans</i>	-	-	+	+	+	+	+	+	+	+
<i>A. clavatus</i>	+	+	+	+	+	+	+	+	+	+
<i>Chaetomium robustum</i>	-	+	-	-	-	-	-	-	-	-
<i>C. globosum</i>	-	-	+	+	+	+	+	+	+	+
<i>C. indicum</i>	+	-	-	-	-	-	-	-	-	-
<i>C. funiculum</i>	-	-	+	+	+	+	+	+	+	+
<i>Cladosporium herbarum</i>	-	-	+	+	+	+	+	+	+	+
<i>Curvularia lunata</i>	+	+	+	+	+	+	+	+	+	+
<i>Fusarium</i> sp.	+	+	+	+	+	+	+	+	+	+
<i>Drechslera nodulosa</i>	+	+	+	+	+	+	+	+	+	+
<i>D. tetramera</i>	+	+	+	+	+	+	+	+	+	+
<i>Melanospora</i> sp.	-	-	-	-	-	-	-	-	-	-
<i>Nigrospora oryzae</i>	-	-	+	+	+	+	+	+	+	+
Non-sporulating	+	-	+	+	+	+	+	+	+	+
<i>Pyricularia oryzae</i>	-	-	+	+	+	+	+	+	+	+
<i>Phoma</i> sp.	-	+	-	-	-	-	-	-	-	-
<i>Penicillium</i> sp.	-	-	-	-	-	-	-	-	-	-
<i>Rhizoctonia solani</i>	-	-	-	-	-	-	-	-	-	-
<i>Rhizopus stolonifer</i>	+	-	+	+	+	+	+	+	+	+
<i>Sordaria</i> sp.	-	-	-	-	-	-	-	-	-	-
<i>Stachybotrys atra</i>	-	-	-	-	-	-	-	-	-	-
<i>Trichoderma viridi</i>	-	+	-	-	-	-	-	-	-	-

Presence (+) or absence (-) of the Fungus on different varieties.

TABLE 2
Percent loss of viability of different varieties of ragi after 30 months of storage

Variety	% germination*		% loss of viability† ($t = 7.68$)
	After harvest	After 30 months of storage	
Purna	100	80	20
Annapurna	100	76	24
Hamsa	93	62	31
Cauvery	100	83	16
H22	98	95	3
PR202	96	87	9
HPB7-6	96	89	7
ROH2	92	83	9
ECW854	92	41	51
EC4840	98	88	9

* Average of 3 replicates.

† Significant at 0.1% probability level.

tural operations and (d) storage⁸. The present observations are in accordance with those made by Ghose⁹ and Tsunoda¹⁰ on rice and Narasimhan and Rangaswami¹¹ on sorghum. *Drechslera nodulosa* which causes seedling blight and leaf spot of *Eleusine coracana* is a major disease of this crop¹² and was found to be associated with all the varieties tested, while most

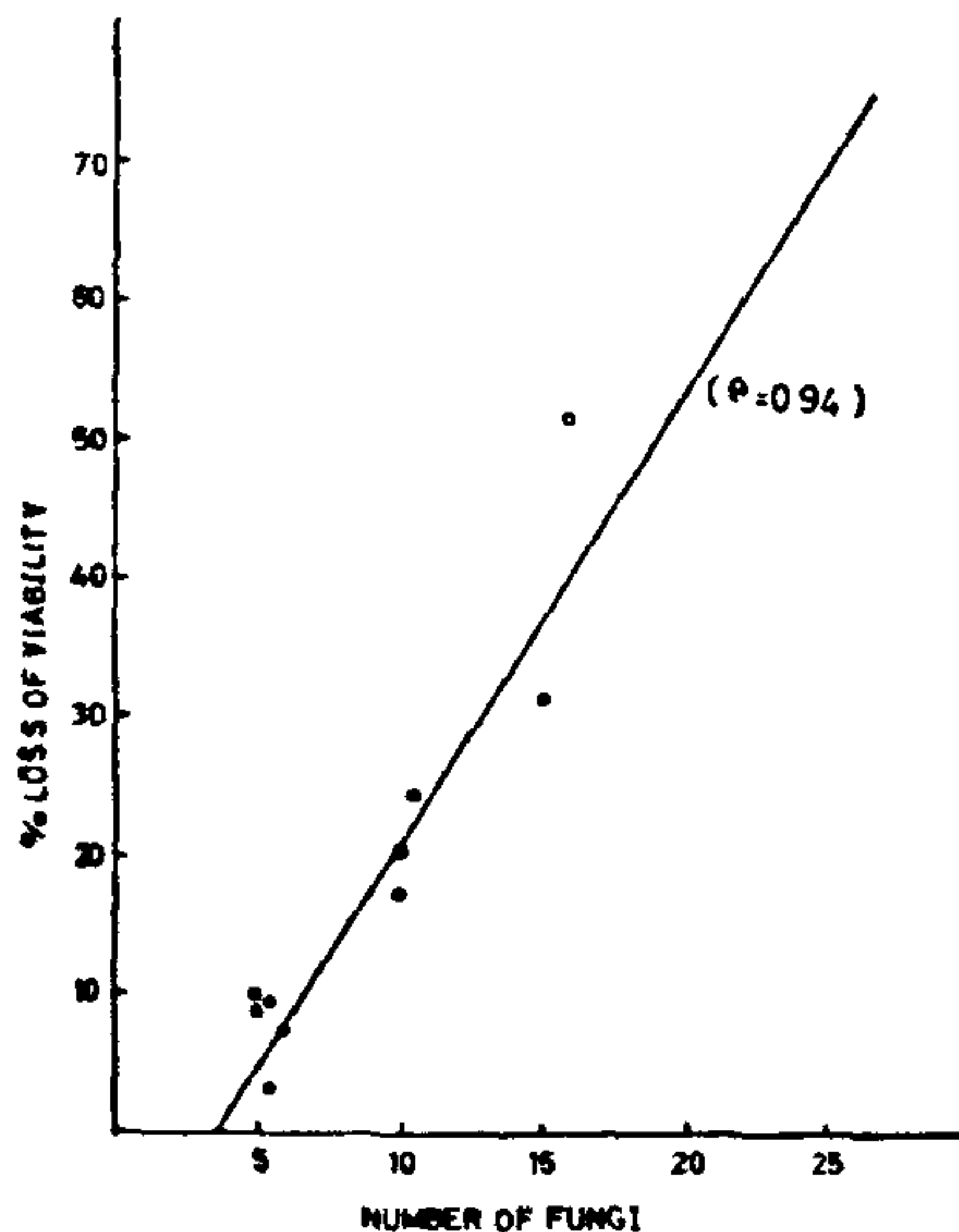


FIG. 1

Figure 1. Relationship between the number of fungi associated with ragi seeds and % loss of viability.

of the other fungi were very inconsistent in their occurrence. In the present investigation four species of *Chaetomium* have been isolated (table 1) of which *C. robustum* Ames. from variety Annapurna is the first record from India.

There are many reports on 80–100% reduction of germinability of the stored grains caused by associated fungal effects^{1,2,13-15}. In the present studies it was observed that there was a significant ($t = 7.68$) loss of viability during 30 months of storage and it was related with the number of fungi associated with the seed. Loss of viability due to the association of *Drechslera*, *Aspergillus*, *Fusarium* and *Curvularia* was observed both in rice⁶ and ragi¹⁶.

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