line nuclear magnetic resonance instrument. The weight of protein per seed in mg was derived from the seed index and the per cent protein of each sample.

The highest mean percentage of protein per seed, kernel percentage and kernel-oil percentage in *G. hirsutum* cultivars were obtained at first and second harvest (table 1). Varietal differences for seed protein percentage and protein per seed were highly significant at second harvest. Estimates of heritability in the broad sense for protein per seed and kernel-oil percentage were also highest at second harvest. A sharp decline in values was noticed at the third harvest. In *G. arboreum* cultivars, the highest values in three of the four attributes were noticeable at first and the lowest at third harvest. Such pattern of variation seemed to correspond with that reported earlier in this material, for seed-oil percentage and seed-oil index[5]. In spite of highly significant differences due to stages of harvest, the cultivar *x* stage interactions were not significant for percentage protein in both species.

Correlation in *G. hirsutum* between oil and protein percentages over three stages of harvest was negative and significant ($r = -0.71^{**}$), similar to that observed earlier in cotton[1]. Such correlation, nevertheless, was non-significant at each one of the three stages, when considered individually. Seed protein and oil indexes were associated favourably, as also noticed by Kohel and Benedict[6]. Higher levels of oil, protein and fibre traits, similar to those in 'Acala SJ' series of cotton in California, may be present in bolls set at early stages in development[8, 9], the lack of significant negative mutual associations at stages may be advantageous in selection. Oil and protein percentages were not negatively correlated to lint yield per plant at stages and also over stages.

Environment generally has a much greater impact in the second half of boll development period[10, 11]. The mean daily minimum and the average temperatures during a period of four weeks were determined prior to each harvest date, in an attempt to correlate them with oil and protein. Seed-oil per cent averages[5] could be positively and significantly correlated with temperatures, in both species. Seed-protein percentage was favourably associated with temperatures in *G. hirsutum* in the present study.

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## SELECTION CRITERIA FOR GENETIC IMPROVEMENT OF WHEAT GRAIN YIELD IN ALKALI SOILS

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ALKALI soils, characterized by pH greater than 9.0 and exchangeable sodium percentage exceeding 30, with consequent highly deteriorated physical properties, affect wheat production over nearly three million hectares, in otherwise highly productive Indo-gangetic plain. Wheat breeders, engaged in genetic improvement of wheat yields in alkali soils are faced with the choice of selecting directly for grain yield, under edaphic stress conditions or making selections for this purpose indirectly via various parameters and indices, quantifying stress-caused damage or plant's resistance rating. The former criterion has low heritability and suffers from a serious limitation as it does not distinguish between plant's genetic yield potential and its genetic capability to withstand specific stress factors[1]. The latter approach is more promising but requires considerable basic information to prove effective.

With a view to identifying reliable selection criteria, for indirect selection for yielding ability under alkali soil conditions, a study was conducted in specially designed test plots using 20 genetically diverse bread wheat varieties grown in two alkali soil grades (pH 8.9 and 9.3), and also in non-stress productive soil, over

three successive seasons. Divergence of the materials listed below was obtained on the basis of their evolutionary history or pedigree as well as their contrasting characteristics including growth habit, pigmentation, morphological features, yielding ability and disease reactions. The experiment was laid out in randomized block design with three replications. Nitrogen compounds, $P_2O_5$, $K_2O$ and $ZnSO_4$ were applied respectively at 150, 60, 40 and 40 kg/ha. Irrigation was given following a specified CPE schedule. Good management care was provided to promote seedling emergence and subsequent growth but all conditions were kept similar during each season.

The following 20 wheat genotypes were studied for their performance in normal (non-stress) and alkali soils. 1. Kharchia 65; 2. Kharchi 9; 3. Rata 385; 4. Narmada 4; 5. Kalyan Sona; 6. Hyb 65; 7. Raj 1972; 8. NP 4; 9. NP 718; 10. C 306; 11. C 591; 12. K 68; 13. WG 357; 14. J 40; 15. WH 147; 16. WH 157; 17. HD 1982; 18. HD 2009; 19. HD 2204; 20. HD 2329.

Considering that grain yield corresponds to the product of biomass (i.e. growth rate × growth duration) and harvest index, correlations of 14 characteristics with grain yield *per se* under stress conditions as well as with the salt stress resistance index (i.e. reduction in performance averaged over the two stress environments) were computed. Phenotypic variances and heritability of these traits were also estimated. Results of this analysis are presented in table 1.

Seedling emergence rate index[1], vegetative growth rate index[2] (i.e. $\frac{\text{Biomass-grain yield}}{\text{Days to anthesis}}$), total biomass and spike weight were highly correlated with grain yield under alkali soil conditions. A simultaneous consideration of correlation coefficients and heritability values of these traits points out that indirect selection for grain yield via one criterion of vegetative phase and another of reproductive phase (spike weight) is likely to prove more successful for achieving yield improvement under alkali soil stress. If so, the most effective combination of the two selection criteria as well as intensities of primary and secondary selection pressures need to be determined[3]. A noteworthy inference emerging from this study is that the total biological yield appears to be the more important selection criterion for improving grain yield under alkali soil conditions in marked contrast to harvest index which is considered to be of overwhelming importance in high-productivity environments[4]. This conclusion derives support from the fact that the traditional wheat cultivars of salt-affected areas are tall characterized by fairly high biological yield but low harvest index[5].

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**Table 1** *Heritability of* 14 *characteristics and their genotypic correlations with grain yield as well as salt resistance index of wheat varieties grown in alkali soils.* (*Soil pH* 8.9 *and* 9.3, *ESP* 24 *and* 36)

| Plant Characteristics | Heritability | Correlation with | |
|---|---|---|---|
| | | Grain yield | Salt resistance index |
| Seed germination % | 48.39 | 0.16 | 0.08 |
| Seedling emergence index | 56.70 | 0.63 | 0.54 |
| Seedling height (3 weeks) | 29.26 | 0.19 | 0.04 |
| Seedling growth rate | 39.52 | 0.42 | 0.40 |
| Mature plant height | 29.46 | 0.34 | 0.30 |
| Days to anthesis | 41.18 | 0.12 | 0.09 |
| Vegetative growth index | 55.49 | 0.66 | 0.74 |
| Ear-bearing tillers/plot | 26.92 | 0.38 | 0.30 |
| No. of grains/plot | 28.10 | 0.36 | 0.41 |
| Grain weight (1000) | 27.74 | 0.49 | 0.51 |
| Spike weight | 69.46 | 0.71 | 0.76 |
| Straw weight/plant height | 38.54 | 0.64 | 0.31 |
| Biomass/plot | 61.68 | 0.62 | 0.48 |
| Harvest index | 24.13 | 0.10 | 0.15 |

N = 360 (20 vars, 2 alkali soils, 3 reps, 3 years). *r* value required for 0.01 level of significance = 0.25.

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## A NEW SPECIES OF MYCOVELLOSIELLA RANGEL

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DURING a survey for the phytoparasitic fungi from the forest flora, an interesting fungus was collected. Detailed taxonomic studies showed it to be a new taxon of species rank. It is described below.

*Mycovellosiella fici* A. N. Rai *et* Kamal sp nov

Maculae hypogenae, parvae, coalescentes et demum partem majorem folii tegentes, brunneae; coloniae hypophyllae, effusae, plus minus byssiodeae, obscure brunneae; hyphae primariae immersae, septatae, ramosae, secundariae superficiales, septatae, glabrae, angustae; stromata debiliter evoluta, superficialia vel immersae, pseudoparenchymatica, fusco-olivacea, 10.8–43.2 $\mu$m diam.; conidiophora laxe fasciculata, macronemata, mononemata erecta vel suberecta, recta vel flexuosa, septata, glabra, simplicia vel ramosa, pallide vel medio–olivaceae, 21.6–90 × 3.6–4.5 $\mu$m; cellulae conidiiferae integratae, terminales, polyblasticae, sympodiales, indistincte cicatricosae; conidia simplicia, sicca, acropleurogena, subhyalina usque medio-olivacea, plerumque transverse septata, rare septo singulo oblique divisa, glabra, clavata usque obclavatocylindrica, ad apices subacuta vel obtusa, ad bases fere obconico-truncata, hilo subincrassato distincto praedita, 10.8–25.2 × 3.6–6.3 $\mu$m.

In foliis vivis *Fici hispidae* L (Moraceae); December 1979, Katarniaghat (West Baharaich Forest Division, U.P., India); leg. A. N. Rai, KR 364, typus, IMI 246390.

Infection spots hypogenous, small, coalescing to cover major part of the leaf surface in due course, brown to dull brown; colonies hypophyllous, effuse, more or less cottony, dull brown; primary mycelium of hyphae immersed, septate, branched, narrow, secondary mycelium superficial, septate, smooth, narrow; stromata poorly developed, superficial or immersed, pseudoparenchymatous, dark olivaceous, 10.8–43.2 $\mu$m in diam.; conidiophores loosely fasciculate, macronematous, mononematous, erect to suberect, straight to flexuous, septate, smooth, simple to branched, light to mid olivaceous, 21.6–90 × 3.6–4.5 $\mu$m; conidiogenous cells integrated, terminal, polyblastic, sympodial, indistinctly cicatrized; conidia simple, dry, acropleurogenous, subhyaline to light mid olivaceous, mostly transversely septate, rarely with 1 oblique septum, smooth, clavate to obclavatocylindric, apices sub acute to obtuse, bases almost obconicotruncate, hila slightly thickened but distinct, 10.8–25.2 × 3.6–6.3 $\mu$m (figure 1).

On living leaves of *Ficus hispida* L (Moraceae); December 1979, Katarniaghat (West Baharaich Forest Division, Uttar Pradesh, India); leg. A. N. Rai, KR 364, type IMI 246 390.

A survey of literature shows[1–15] that only one species *Mycovellosiella maclurae* (Ell *et* Langl) Deighton[6] has been described on the host family. On comparing the symptomatological and morphological features of the present fungus with those of *M. maclurae*, the former is found to differ from the latter so much so that it cannot be conspecific with the same.

Thus, the present collection deserves description as a new species.

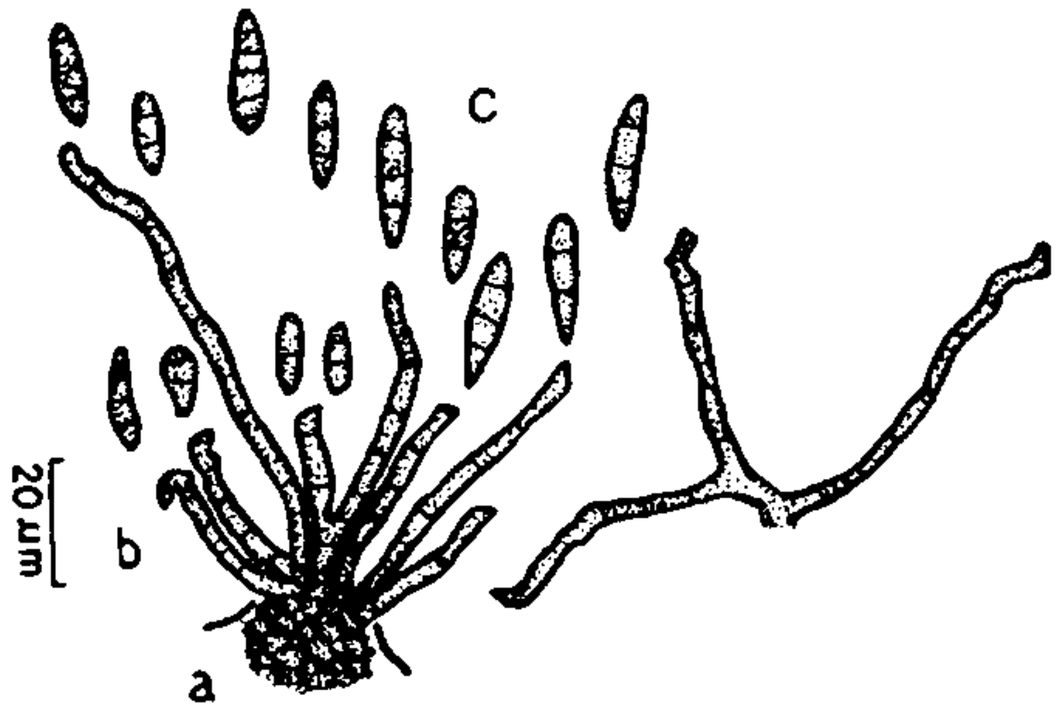


**Figure 1.** *Mycovellosiella fici* A. N. Rai *et* Kamal sp nov **a.** Mycelium, **b.** Conidiophores, **c.** Conidia.