

RESEARCH COMMUNICATIONS

Table 1. Changes in shoot and root lengths of 8-day-old seedlings of pea (*Pisum sativum* L.) varieties under different external water potentials. Dark incubation was at 24±1°C.

Water potential (bar)	Av. shoot length (cm)			Av. root length (cm)			Root/shoot ratio		
	Arkel	Azad Pea 1	Pant Uphar	Arkel	Azad Pea 1	Pant Uphar	Arkel	Azad Pea 1	Pant Uphar
(Control)	1.00	3.90	2.30	1.60	8.60	3.10	1.60	2.21	1.35
-3.0	0.60	2.00	1.23	1.60	3.80	1.74	2.66	1.90	1.41
-5.0	0.30	0.60	0.54	0.90	2.50	1.70	3.00	4.15	3.15
-7.5	—	0.40	0.52	—	2.20	1.60	—	5.50	3.07
-10.0	—	—	0.50	—	—	1.50	—	—	3.00

— No germination.

L.S.D. (at 5% level of significance) = 1.08.

at -3.0 and -5.0 bar, average root and shoot lengths were higher in Azad Pea 1 followed by Pant Uphar and Arkel while at -7.5 bar average shoot length was higher in Pant Uphar and average root length was higher in Azad Pea 1. Restricted water availability of over -3.5 bar has been reported to result in shorter and thinner pea roots⁵. Retardation in growth (shoot and root lengths) in response to increasing moisture stress has also been reported in maize composites³ and wheat hybrids⁴. Data on root : shoot ratio (Table 1) revealed that in all the three varieties it increased with decreasing water potential. Growth of roots is reported to be less affected by water shortage than that of aerial parts⁶.

There was marked reduction in total lipid content of roots of eight-day-old seedlings of all the three varieties (Figure 2) with decrease in water potential. However, total lipid content at decreasing water potentials remained higher in Azad Pea 1 followed by Pant Uphar and Arkel and this pattern closely followed the germination pattern of these varieties at decreasing water potentials. More reduction in membrane phospholipids is reported in drought-sensitive varieties than that of drought-resistant varieties⁷. The present results (Figures 1 and 2) revealed that the variety (Azad Pea 1) exhibiting higher total lipid content of roots at decreasing water potentials showed higher germination percentage and seedling growth and *vice versa*. Higher lipid content of roots of Azad Pea 1 even at increasing water stress conditions appears to be significant in

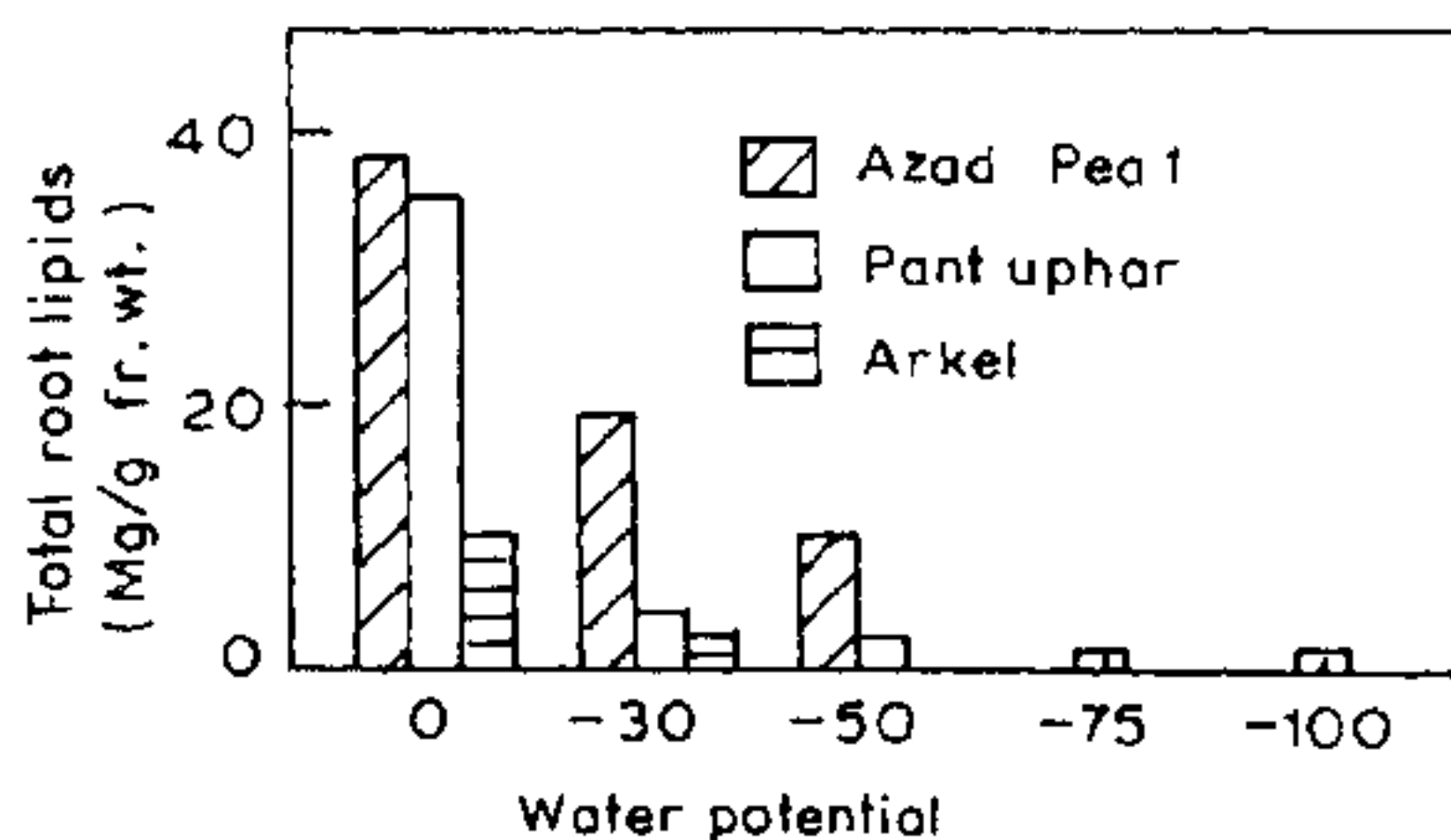


Figure 2. Total lipid content of roots of 8-day-old seedlings of varieties Azad Pea 1, Arkel and Pant Uphar or pea (*Pisum sativum* L.) after dark incubation at 24±1°C in different water potentials.

maintaining the membrane integrity of roots and providing energy to carry out essential metabolic processes during germination. Further, the sharp decrease in total lipid content of roots under water stress conditions may either be due to its degradation during germination⁸ or lack of *de novo* synthesis.

The results thus, suggest that such studies on the evaluation of drought-resistant character should be extended to other crops as well with the use of polyethylene glycol '6000'. Knowledge of the critical water potential that prevents seed germination and retards seedling growth of a particular crop/variety is valuable for agricultural workers.

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A new hybrid between *Aegilops* and *Secale*

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Without employing embryo culture techniques, intergeneric hybrids between *Aegilops bicornis* and tetraploid rye (*Secale cereale*) were produced. The hybrid plants were completely male sterile with dominant rye characters. Preponderance of univalents at metaphase-I indicated lack of homology between the chromosome complements of the parental species.

WITHOUT using embryo rescue and culture techniques, an intergeneric hybrid between *Aegilops bicornis* (Forsk.) Jaub

et Spach ($2n=14=S^bS^b$) and *Secale cereale* L. ($2n=28=RRRR$) was produced under the collective idea of 'adding genetic variability'. The *Aegilops* × *Secale* hybrid is of interest because it offers a unique opportunity to study how *Aegilops* and *Secale* nuclear genomes interact in *Aegilops* cytoplasm. Further, because the chromosomes of *S. cereale* are markedly larger than those of *A. bicornis* this hybrid also provides an excellent material to study the biosystematic relationships between the two genera.

The F_1 hybrid plants were vigorous, well spiking and completely male sterile, with dominant rye characters, but the spikes lacked awns (Figure 1). Attempts were made to produce amphidiploids by treating F_1 hybrid plants at 3–4 tiller stage with 0.25% colchicine solution. However, the treated plants remained self-sterile and no viable pollen was observed in any of the anthers. Further, one cultivar each of bread wheat (Chinese Spring) and hexaploid triticale (TL 2396) was crossed onto the intergeneric hybrid and only two seeds, one per cross, were obtained. The seed set also confirmed the partial viability of female gametes.

At the meiotic metaphase-I in the F_1 hybrid, majority of the PMCs studied revealed the preponderance of univalents, though up to three (maximum) atypical rod bivalents were also recorded. On the basis of distinctly larger size and morphology of the chromosomes, it could be inferred that the observed bivalents were autosyndetic in nature, and were from the rye genome. Occurrence of autosyndetic pairing between the chromosomes of R genome conforms to that reported earlier¹. Meiotic configurations (MI) further suggest as if *Aegilops* cytoplasm is less congenial for bivalent formation. Had there been no effect(s) of *Aegilops* cytoplasm, RR genome from tetraploid rye should have formed seven bivalents at metaphase-I as against three (maximum) observed autosyndetic bivalents (T. Tsuchiya, pers. commun.). Since the reciprocal crosses were not available, the probable implication of *Aegilops* cytoplasm in the suppression of autosyndetic pairing could not be confirmed.

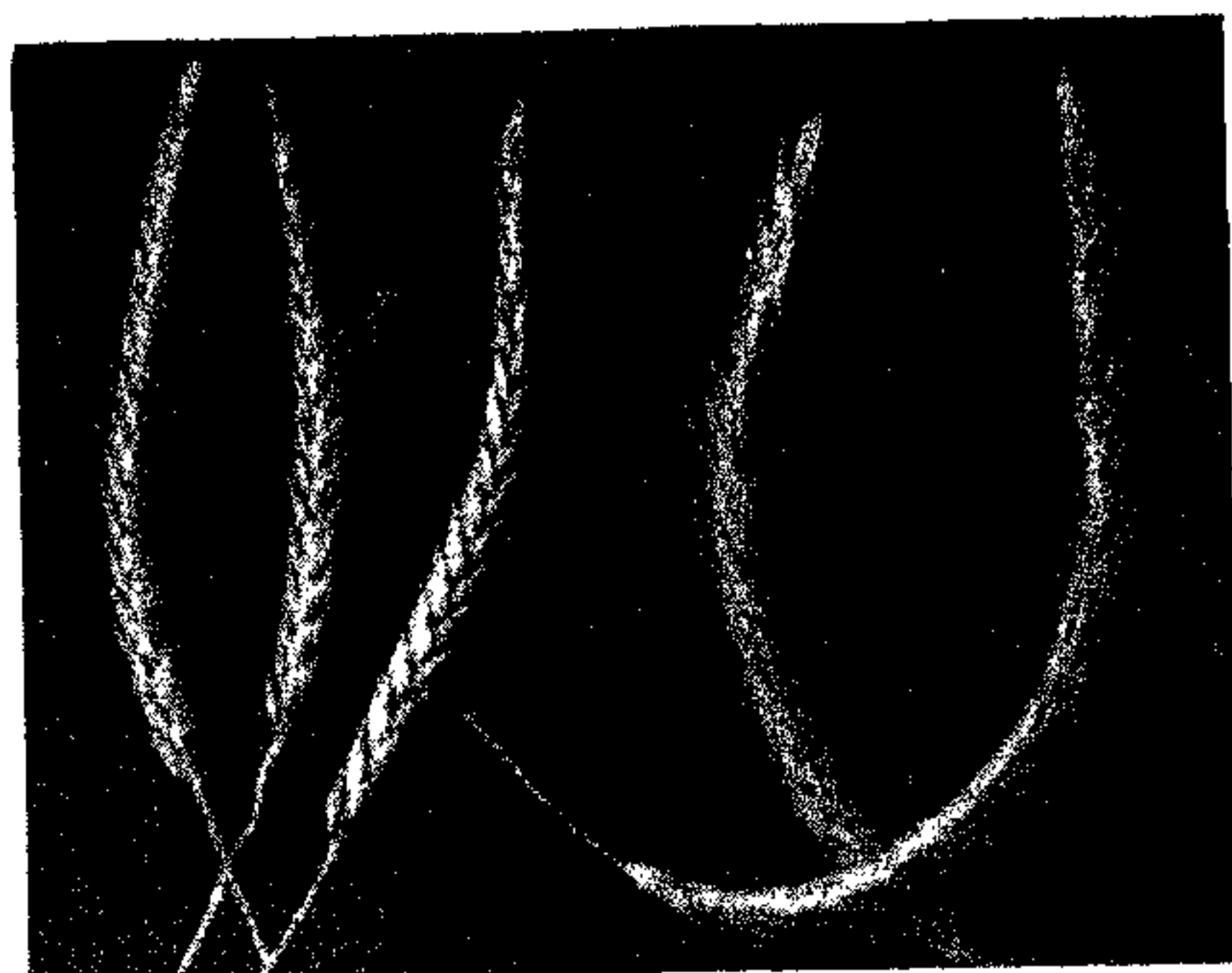


Figure 1. Three spikes of the hybrid between *Aegilops bicornis* and *Secale cereale* (left) and two spikes of *Secale cereale* (right).

This inference, however, merits further investigation.

Absence of heteromorphic bivalents(s) on the other hand, is indicative of non-homology existing between the chromosome complements of the parental genome.

A. bicornis and *S. cereale* are known for their high degree of resistance to different pathogens. A few desirable traits include; powdery mildew resistance in *A. bicornis*, and rust resistance coupled with high protein content in *S. cereale*². Intergeneric hybrid under report was basically produced for reciprocal transfer of desirable traits from *A. bicornis* to the cultivar(s) of *S. cereale*. However, the failure of chiasmata associations between the chromosome complements of the parental genomes suggests that an effective isolation barrier does exist which, unless some specialized techniques³⁻⁵ allowing the breaking and fusion of chromosomes are employed, would not permit the recombination and transfer of genetic information between the two genera.

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Some biochemical changes in the shoots of pearl millet infected by downy mildew

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In order to probe into certain biochemical changes in the pearl millet shoots infected with downy mildew pathogen (*Sclerospora graminicola* (Sacc.) Schroet), total leaf chlorophyll, total phenol and total free amino acid contents in the shoots and the specific activity of the enzyme nitrate reductase in both shoots and roots of the host were analysed. The estimations revealed that the total leaf chlorophyll, total phenol and total free amino acid contents were found low whereas the nitrate reductase activity was found to be high in both the diseased shoots and roots of pearl millet (*Pennisetum americanum* L. Leek).

PEARL millet (*Pennisetum americanum* L. Leek) downy mildew (*Sclerospora graminicola* (Sacc.) Schroet.) is a national problem. Various biochemical alterations take place during pathogenesis but these have not been studied systematically. This communication reports changes in the