

first double trisomic while only 10% of PMC's were seen with such association in second case. The frequency of cells with $7^{II} + 2^I$ was maximum (54%) followed by 40% of cells with $6^{II} + 1^{III} + 1^I$ in second double trisomic (Fig. 3). Concomitantly a complete absence of $6^{II} + 1^{II}$ or 8^{II} in cytological preparations of these stocks excludes the possibility of their becoming tetrasomic types. The occurrence of high frequency of $5^{II} + 2^{III}$ and a rare frequency of univalents with bivalents in first double trisomic is indicative of involvement of both extra chromosomes as the longer chromosomes of the set. Contrarily, the low frequency of trivalents and a high frequency of univalents in the second double trisome suggest that at least one extra chromosome of this stock is shorter one. At AI 8:8 disjunction was noticed in 56% and 40% cells of first and second double trisomics respectively. But the high incidence of univalents has probably caused the frequent distribution (48%) of 9:7 chromosomes (Fig. 4) and formation of univalent laggard in second trisome. Though equal (8:8) and unequal (9:7) distribution should be equally frequent in both kinds of associations of cells, i.e., either with $5^{II} + 2^{III}$ or with $6^{II} + 1^{III} + 1^I$ in prophase I. However, it seems as though there is built in division mechanism which results in a tendency for equal number of chromosomes to go to the poles (Michel and Burnham³). The studies reported here show the high frequency of equal disjunction and involvement of both longer extra chromosomes in first stock which eventually result into complete sterility of both pollen and ovules due to their trisomic nature. But the relatively higher incidence of 9:7 disjunction has led to some fertility of gametes (approx. 10%) as well as some degree of seed set in the second stock. However, no double trisomic could be recovered probably due to lack of simultaneous transmission of both extra chromosomes in the small progeny population of second double trisomic studied.

April 10, 1981.

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RELEVANCE OF THE MEMBRANE RESTING POTENTIAL FOR THE STUDY OF DROUGHT RESISTANCE IN WHEAT (*TRITICUM AESTIVUM* L.) CULTIVARS

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CERTAIN electrophysiological parameters have been recently found to be of considerable relevance for the behaviour under stress of various plants. The permeability of the cell membrane to diverse organic and inorganic molecules and the membrane resting potential have been observed to vary systematically in relation to cellular injury¹, frost hardiness², passive and active transport of ionic and non-ionic species, hormone action³, as well as disease resistance⁴.

Present work compares the resting membrane potentials (V_0) of two wheat cultivars known to be differing in their resistance to drought, in order to see whether V_0 can serve as an electrophysiological index of drought resistance. Resting potential being the outcome of ionic concentration gradients and the relative permeability of the membrane to the ions involved as well as of electrogenic pumps, it is liable to change under the influence of such environmental stresses, which affect these variables.

The ability to adjust their internal osmotic pressure and thus turgor pressure in response to salt and water stress, has been observed in many plant cells^{5,6}. In the case of halophytes it has been found that they possess low permeability to cations and make use of low molecular weight organic compounds as osmotica⁷. The drought resistant varieties apart from having an initial stock of osmotica are capable of uptake of K^+ with the simultaneous generation of proline and malate as organic counterions when they are subjected to water stress. However, so long drought conditions do not exist, the inside concentration of K^+ is kept low in order to maintain proper turgor pressure⁸⁻¹⁰. Under such conditions the K -diffusion potential given by Nernst's equation would give a higher value for the membrane resting potential;

$$V^{in} - V^{out} = V_0 = \frac{RT}{F} \ln \frac{K^{out}}{K^{in}}$$

It is therefore expected that the plants adapted to arid and saline environment would show a high value of V_0 , i.e., low absolute value of V_0 , under normal conditions.

Working on the above hypothesis, we studied the resting potentials of two cultivars of wheat known for

TABLE I
Cell Membrane Potential of two cultivars of wheat
(*Triticum aestivum*, L.)

C-306		HD-2204	
Sl. No.	mV	Sl. No.	mV
1.	-122	1.	-149
2.	-116	2.	-129
3.	-105	3.	-132
4.	-126	4.	-133
5.	-104	5.	-132
6.	-134	6.	-132
7.	-122	7.	-145
8.	-123	8.	-153
9.	-125	9.	-149
10.	-134	10.	-123
11.	-124	11.	-126
12.	-128	12.	-156
13.	-113	13.	-135
14.	-133	14.	-139
15.	-122	15.	-130
16.	-124	16.	-131
17.	-127	17.	-131
18.	-129	18.	-124
19.	-122	19.	-130
20.	-101	20.	-137
21.	-127	21.	-121
22.	-124	22.	-140
23.	-118	23.	-134
24.	-121	24.	-135
25.	-121	25.	-127
26.	-124		
27.	-125		
28.	-120		

$\bar{X} = -122 \pm 1.57$ (C-306). $\bar{X} = -135 \pm 1.89$ (HD-2204). $t = 5.44 = < 0.01$.

their differing drought resistance and for this reason, assigned to two different regions for open field cultivation.

Following the standard procedure¹¹ coleoptile segments were excised from 66–88 hour old wheat seedlings (*Triticum aestivum*, L. varieties C-306, drought resistant and HD-2204, susceptible to drought and recommended exclusively for good irrigation conditions). The seedlings were grown in dark, at $25 \pm 2^\circ \text{C}$. The coleoptiles, 2.5–3.5 cm long, the enclosed leaves removed by a longitudinal cut, were mounted vertically in a plexiglass chamber ($3.5 \times 1.5 \times 1$ cm) that was immersed in bathing solution (IX solution)¹², for 3–6 hours in dark. The chamber was later fixed to the stage of a microscope. A 3M KCl-filled glass microelectrode (tip diameter $< 1 \mu\text{m}$, tip resistance

6–24 M Ω and tip potential < 12 mV) coupled through a Ag/AgCl electrode (WPI-USA) was used as the measuring electrode. The indifferent electrode was also a glass micropipette, approximately 100 μm internal diameter filled with 3 M KCl in 2% agar, also coupled to a Ag/AgCl electrode. Both salt bridges were connected to an electrometer amplifier (WPI model M-701) and then to a chart recorder 22660 (Stoelting, USA). Insertion of micropipette with a micromanipulator (Leitz) into the cells on the cut surface of the coleoptile was observed through a horizontally mounted microscope. The chamber was illuminated by a 50 W halogen lamp. The readings were recorded on the chart when the membrane potential difference had stabilised for not less than 45 minutes after insertion of the micro-electrode.

Individual cell membrane potentials in millivolts for the drought resistant and susceptible varieties are given in Table I. The mean value for the drought resistant variety was found to be -122 mV (SE 1.57), while the same for susceptible variety was -135 mV (SE 1.89). Statistical analysis showed that the means differed from each other significantly with 99% reliability ($t < 0.01$).

The experimental data given above confirm the hypothesis that drought resistant varieties under normal conditions would show a higher V_0 (low absolute value) as compared with those that are susceptible to drought. It can therefore be expected that V_0 could serve as an electrophysiological index for determining the drought resistance of plants in general.

The authors are thankful to Dr. V. S. Mathur, Wheat Breeder, Division of Genetics, IARI, for providing the seed material. A.R. is thankful to CSIR for providing financial assistance in the form of a JRF.

May 12, 1981.

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MALAYAEASPORA COSTATA GEN. ET SP. NOV FROM THE TERTIARY COAL OF MALAYA

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THE tertiary coal in Malaya rests unconformably on the post Triassic and Triassic basic and ultrabasic intrusive rocks. One of us (B.S.T.) collected the co-sample from 3 km west of Kuala Lumpur, Malaya, in 1953. Trivedi and Chaturvedi¹, Trivedi and Verma² and Trivedi, Chaturvedi and Verma³ described various microfossils from this coal. The present authors recovered a rich palynological assemblage from this sample comprising 18 spore and pollen genera out of which one new genus, viz., *Malayaeaspora* is described here.

Systematic Palynology

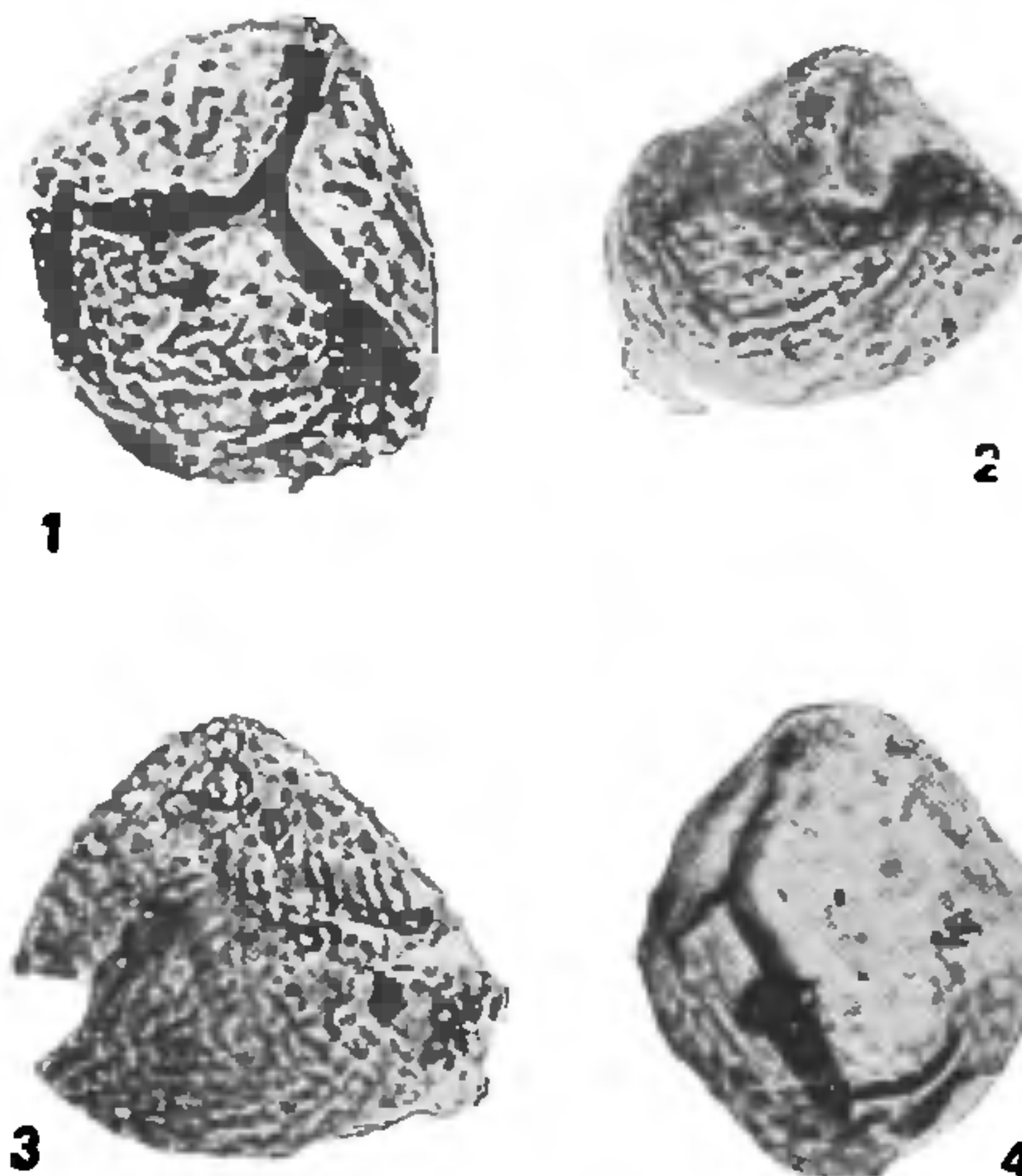
Anteturma	<i>Sporites</i> H. Potonie, 1893
Turma	<i>Triletes</i> (Reinsch) Potonie and Kremp, 1954
Subturma	<i>Azonotriletes</i> Lubert, 1935
Infraturma	<i>Murornati</i> Potonie and Kremp, 1955
Genus	<i>Malayaeaspora</i> gen. nov.
Type species	<i>Malayaeaspora costata</i> sp. nov.

Diagnosis

Spores triangular-subtriangular. Trilete rays well developed. Exine laevigate on proximal side distally exine verrucose-costate, verrucae closely placed adhere together and aligned in rows to provide the appearance of costae.

Description

Proximo-distally fully flattened specimens rare spores preserved mostly laterally. Proximal side thinner, seems to be concave, distal side thicker, seems



FIGS. 1-4. *Malayaeaspora costata* gen. et sp. nov. Fig. 1. Holotype, $ca \times 500$. Figs. 2 and 4. Note the laevigate exine on the proximal side, $ca \times 500$. Fig. 3. Note verrucae on the distal side aligned in rows to provide costate appearance, $ca \times 500$.

to be convex. Distal side heavier than proximal due to presence of sculptural elements. Sometimes proximal side caves in, size range $45-77 \mu m$. Psilate nature of proximal side clearly visible on laterally preserved specimens. Trilete rays distinct, rays flappy, broad, extending upto three-fourths radius. Some specimens with monolete and oval shape also observed, proximal side in them like other specimens laevigate and distally verrucose-costate. Ornamentation on distal side well developed. Costae in some specimens raised, distinct run without any break, parallel to each other, rarely branched. In others, low set verrucae juxtaposed, coalesce together, align in rows to form costae. The costae in these specimens slightly discontinuous, few verrucae could be deciphered.

Comparison—Cicatricosisporites

Potonie and Gelletich⁴ comes close to the present genus in shape and presence of costae. It may, however, be mentioned that *Malayaeaspora* proposed here has no costae on the proximal side and they are restricted only to the distal side. *Striatriletes* van der Hammen emend. Kar⁵ is triangular to subcircular in shape, its size varies from $40-140 \mu m$, costate, generally originate at interray area or at ray ends and traverse on respective distal side to form three concentric rings.