Table 2 *Effect of Basalin and Saturn on Stomatal conductance (cm sec^{-1})*

Plant Species	Leaf surface	Control	Basalin 1000 ppm (hr)			Saturn 1000 ppm (hr)		
			24	48	72	24	48	72
Commelina benghalensis L.	Adaxial	0.20 ±0.006	0.16 ±0.002	0.13 ±0.001	0.14 ±0.002	0.15 ±0.002	0.13 ±0.004	0.13 ±0.001
	Abaxial	0.31 ±0.002	0.26 ±0.002	0.27 ±0.005	0.29 ±0.004	0.29 ±0.003	0.21 ±0.002	0.17 ±0.001
Digera arvensis Forsk.	Adaxial	0.24 ±0.005	0.20 ±0.006	0.17 ±0.002	0.20 ±0.008	0.17 ±0.004	0.19 ±0.002	0.22 ±0.001
	Abaxial	0.25 ±0.007	0.19 ±0.002	0.16 ±0.001	0.24 ±0.002	0.19 ±0.003	0.15 ±0.002	0.14 ±0.002
Euphorbia hypericifolia L.	Adaxial	0.22 ±0.003	0.17 ±0.002	0.10 ±0.006	0.10 ±0.001	0.11 ±0.001	0.10 ±0.007	0.11 ±0.001
	Abaxial	0.25 ±0.006	0.21 ±0.006	0.18 ±0.001	0.16 ±0.006	0.18 ±0.004	0.17 ±0.006	0.14 ±0.004

(Values are the mean of 5 observations ± S. E.)

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STUDIES ON SALT RESISTANCE IN WHEAT I. GROWTH AND DEVELOPMENT

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AMONG the wheat (*Triticum aestivum* L.) genotypes presently cultivated in India, variety Kharchia-65 is considered as the most salt resistant[1] and C-306 relatively susceptible[2] to salt stress. To understand the basis of salt tolerance in plants, a comprehensive programme was undertaken in which these two genotypes were studied in detail. In this communication, we report the relative salt resistance in the two genotypes at various stages of growth and development and the factors which contribute towards better salt resistance of Kharchia-65 over C-306 in terms of grain production.

The experiments were conducted in a screen house using sand culture. Polyethylene bags containing about 9 kg of thoroughly washed river sand were provided with a hole in one of the two corners of the bag. The hole was covered on the inside with a wad of glasswool to provide free drainage of water and also to check the sand loss. The bags were wrapped with a black polyethylene sheet to protect roots from exposure to light and to prevent algal growth. Before sowing, the bags were flooded with Hoagland's nutrient solution, with or without the salt mixture required to be added for salinization. A mixture of

NaCl, $CaCl_2$, $MgCl_2$ and Na_2SO_4 was used* so as to have Na^+, Ca^{2+} and Mg^{2+} in the ratio of 5:2:3 and Cl^- and SO_4^{2-} in the ratio of 8:2 on milli equivalent basis. Saline solution was prepared by the addition of 180 meq salt mixture per litre of the nutrient solution which had a final electrical conductivity of 180 ± 0.5 millimhos/cm at 25°C. Each bag was supplied at weekly intervals with approximately 3.5 l of the appropriate culture solution which was far in excess of the quantity required for saturation and was, therefore, sufficient to leach out the salts already present and replenish them with the fresh solution. After obtaining the desired levels of culture solution in 50 bags, each for non-saline and saline conditions, 10 seeds of each variety were sown in each bag at uniform depth and distance in the first week of November. After recording the germination percentage, thinning was carried out from time to time and finally two plants of comparable growth under each treatment in each bag were retained. The plants were sampled at the following stages of growth and development: (1) prior to tillering (30-day old plants) (2) prior to anthesis (55-day old plants) (3) grain filling (100-day old plants) and (4) maturity. Three bags were sampled during each sampling and five plants were used for recording data.

Germination was delayed in both the genotypes by 3 or 4 days under the influence of salinity with a final germination of 80–90%. During the vegetative phase, C-306 proved to be more salt resistant than Kharchia-65 in terms of leaf area per plant, shoot and total dry matter (figure 1). However, after the onset of reproductive phase, Kharchia-65 was more salt resistant than C-306 in terms of grain production. The various

* This particular mixture of salts was selected as a source of mixed type of salinity where Na^+ and Cl^- are the predominant ionic species.

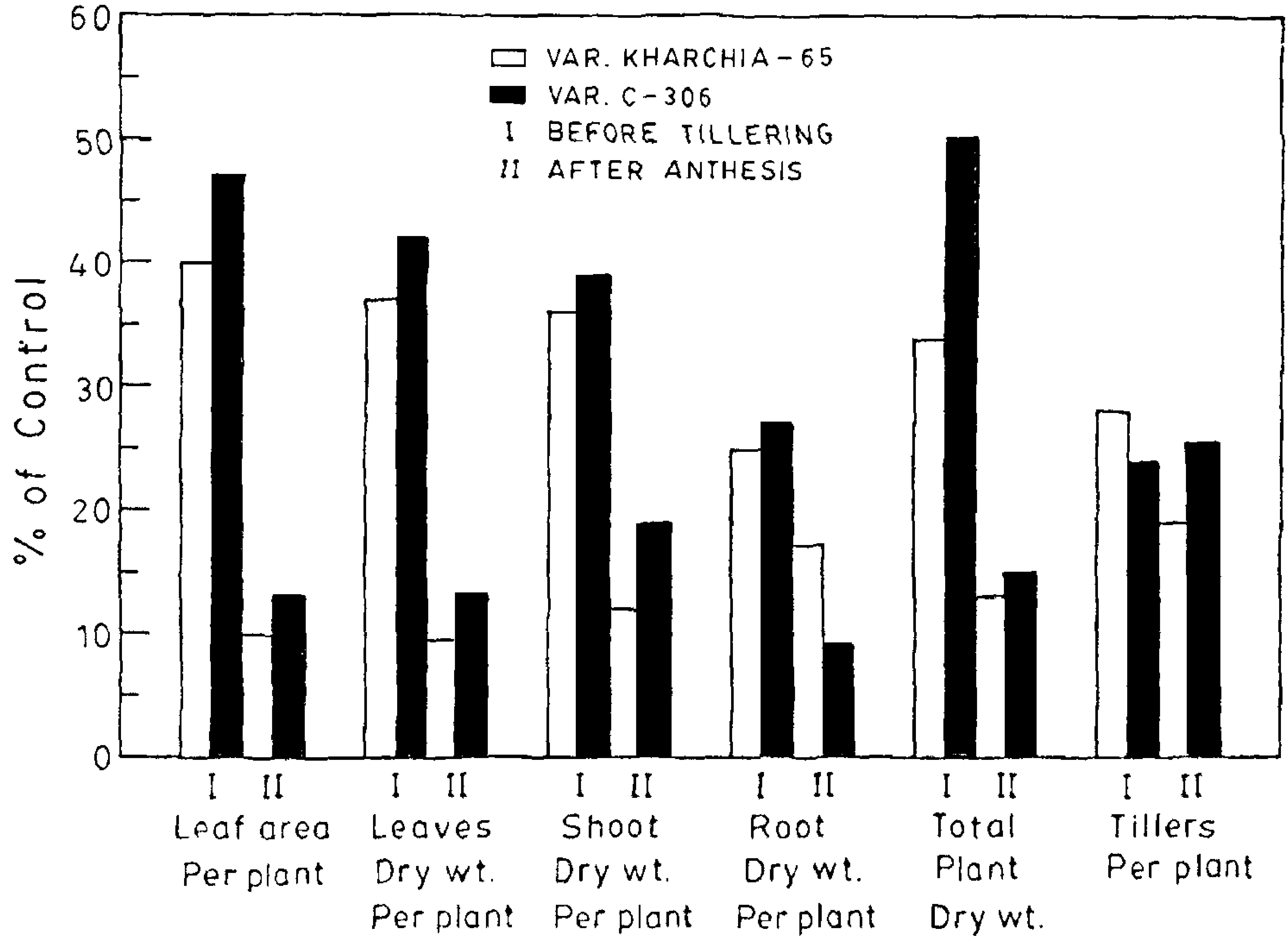

Figure 1. Effect of salinity on various growth parameters in the two wheat varieties (values expressed as percent of control).

factors which may be directly or indirectly linked with the reversal of resistance are discussed below.

Tillering was delayed by 10–12 days in Kharchia-65 and by 20–22 days in C-306 which must have curtailed the grain filling period of the ears on tillers more in C-306 than in Kharchia-65. As the relative reduction in the production of effective tillers (tillers bearing ears or inflorescences) was the same, reduced tillering was not a factor contributing towards differences in yield.

Dry weight of the root was more reduced in Kharchia-65 before tillering but the pattern distinctly reversed after tillering (figure 1). As expected[3,4] the root/shoot ratio decreased in the two genotypes before tillering. However, after tillering it increased in Kharchia-65 and decreased in C-306 (146% and 47% of their respective controls). This might account for the better performance of Kharchia-65 in the later stages.

The flag leaf constitutes the main source of assimilates for the developing grains. In C-306 plants growing under saline conditions, necrosis at the tip of the flag leaves was observed prior to anthesis. This was followed by progressive drying up of the leaf which ultimately led to the drying of nearly two-third of the lamina in a majority of cases by the advent of grain filling. In addition, C-306 plants growing under saline conditions matured 8 to 12 days earlier than the controls. The ultimate partitioning of dry matter between grain and vegetative parts is indicated by the grain:straw ratio or the 'harvest index'. The most fundamental factor affecting this is the ratio of duration of vegetative period to the duration of reproductive period[5]. Harvest index has generally been reported to decrease under saline[6] as well as drought[7] conditions. In the present study, the harvest index which was low in Kharchia-65 (27.9) as compared to C-306 (38.8) under non-saline conditions decreased in C-306 (33.2) and increased in Kharchia-65 (38.2) under the influence of salinity (figure 2). The grain size of Kharchia-65 was also slightly reduced by salinity. Thus, delay in the advent of tillering, necrosis of the flag leaf and early maturity were some of the factors which resulted in the greater decrease in 100 grain weight as well as total grain weight per plant in C-306 than Kharchia-65 (in terms of absolute weight/plant the figures for the two genotypes were 2.9 and 4.9 respectively; see figure 2). Although the total dry matter production was lower in Kharchia-65 under saline conditions, these plants were able to make a better use of it in grain filling. It is possible that in the case of C-306 salinity impaired translocation of metabolites and thus retarded or prevented the development of grains since the accumulation of metabolites in mature photosynthesising leaves of barley[8] and corn[9] has been attributed to a reduction in the number of active sinks. There is some evidence which suggests that salinity suppresses the translocation of photosynthates from the leaves to the roots of beet[10]. Salinity suppresses the development of phloem relatively more than the development of xylem and paranchymatous tissue[11], so that the transport system itself could become limiting in the salt affected plants. In the present investigations also some changes in the metabolism of phospho-organic compounds which resulted in the accumulation of certain fractions were observed (results to be published elsewhere) which support better performance of Kharchia-65 over C-306 in terms of grain yield under saline conditions.

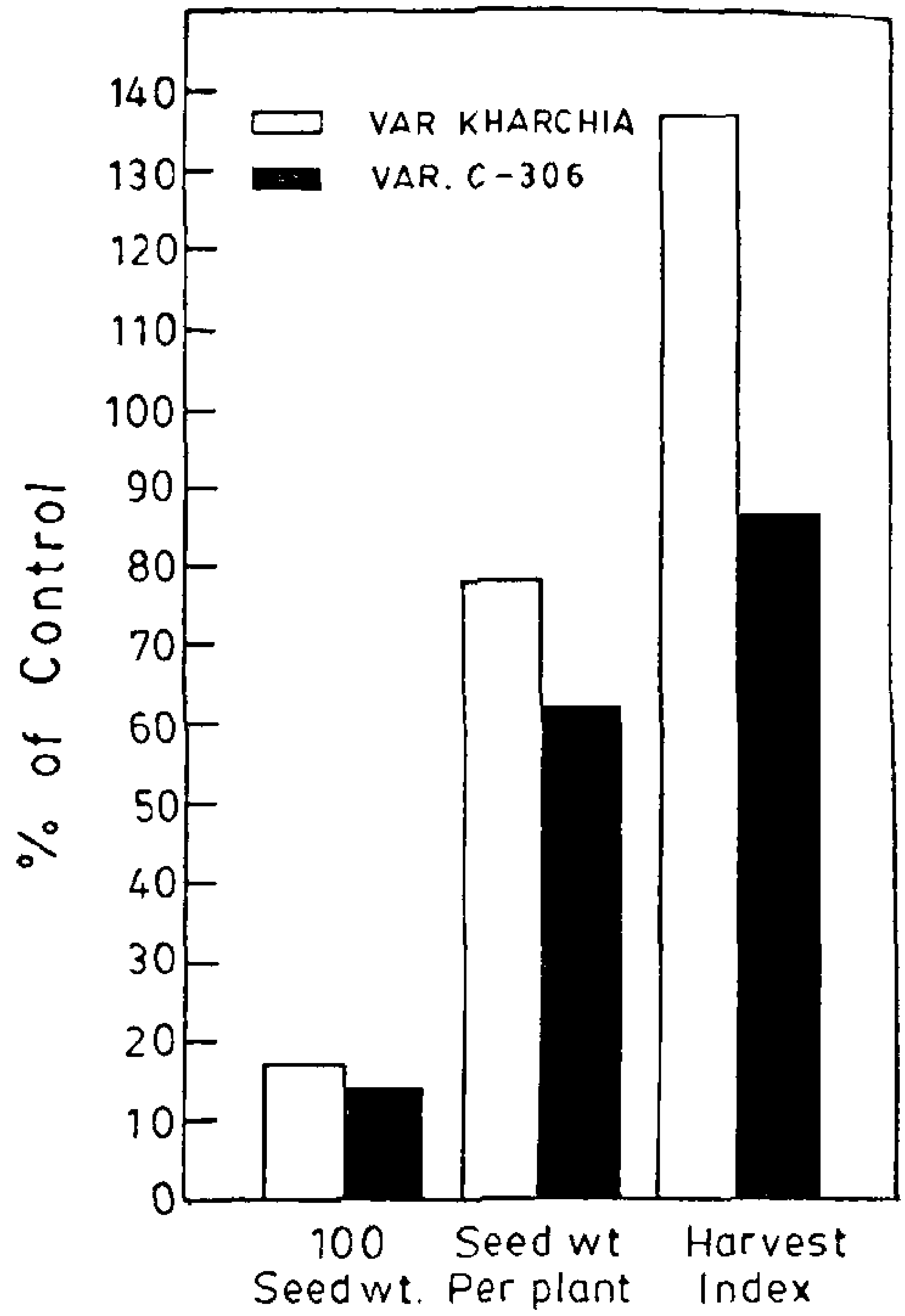

Figure 2. Effect of salinity on yield parameters in the wheat varieties (values expressed as percent of control).

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TWO NEW SPECIES OF *PHOMA* FROM INDIA

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DURING an extensive survey of leaf-spot diseases of Amravati and its suburbs in September 1983 the authors came across two interesting fungi and isolated the same on Asthana and Hawker's medium 'A'. The isolates were sent to the Commonwealth Mycological Institute, Kew, England where they were identified by Dr B. C. Sutton as *Phoma* sp and could not be placed under any known species. Hence the two species have been reported as new species of *Phoma* as *Phoma helianthi* sp nov on *Helianthus annus* L and *Phoma vulgaris* on *Sorghum vulgare* Pers.

(1) *Phoma helianthi* sp nov obtained from living leaves of *Helianthus annus* L. (Asteraceae), 14–9–1983, IMI No. 285465, College Botanical Garden, Camp, Amravati.

The leaf-spots were large, linear, oval or irregular surrounded by a prominent boundary; pustules dorsal, small, black and spherical. The leaf dried on severity of infection.

Hyphae light brown, branched, septate, 2.7–3.4 μm wide; pycnidia globose to spherical or sub-globose, dark brown, ostiolate, thin-walled, 78.3–189 μm (average 135 μm) in diameter; conidia hyaline, 1-celled, oval, measuring 3.5–5.4 × 2–2.7 μm (average 4 × 2 μm). Isolated from infected leaves of *Helianthus annus L.*

Culture deposited at C.M.I., Kew, England, No. 285465.

Latin Diagnosis

Hyphae pallide brunneae, ramosae, 2.7–3.4 μm latae; pycnidia globosa vel sub-globosa, fusca brunnea, ostiolata, cum pariete tenui, 78.3–189 μm (medietas 135 μm) diametro; conidia hyalina, 1-cellularia, ovata, 3.5–5.4 × 2–2.7 μm (medietas 4 × 2 μm) lectae foliis infectis *Helianthi anni.* L.

Cultura posita in C.M.I., Kew, England, Sub No. 285465.

(2) *Phoma vulgaris* sp nov obtained from living leaves of *Sorghum vulgare* Pers. (Poaceae), 14–9–1983, I.M.I. No. 285477, Manjarkhed.

Leaf spots large, oval or irregular with a prominent dark brown margin; pustules dorsal as well as ventral, small, black, spherical and scattered. Drying of leaf was observed at severity of infection covering about 25% to 40% of the leaf lamina.

Hyphae light to dark brown, branched, septate, 2.7–3.6 μm wide; pycnidia globose to sub-globose, dark-brown, ostiolate, immersed in host tissue, with a short beak, 72.9–121.5 μm (average 81 μm) in diameter; conidia hyaline, 1-celled, oval to oblong, 2.7–8.2 × 2.0–2.7 μm (average 5.4 × 2.7 μm). Obtained from diseased leaves of *Sopghum vulgare* Pers. Culture deposited at C.M.I., Kew England bearing the No. 285477.

Latin Diagnosis

Hyphae pallide vel fusco-brunneae, ramosae, septatae, 2.7–3.6 μm latae; pycnidia globosa vel sub-globosa, fusco-brunneae, ostiolata, immersa in textura hospitis, cum rostro brevi, 72.9–121.5 μm (medietas 81 μm) diametro; conidia hyalina, 1-cellularia, ovata vel oblonga, 2.7–8.2 × 2.0–2.7 μm (medietas 5.4–2.7 μm); lectae foliis infectis *Sorghi vulgaris* Pers.

Cultura posita in C.M.I., Kew, England, Sub No. 285477.