

(d) What are the perspectives as regards the types (and the design) of electrodes and the techniques to be employed in such studies? These questions were taken up during a recent symposium organised by the SAEST at Karai-kudi.

(a) S. K. Rangarajan, besides reviewing critically the present state of the theory of porous electrodes, presented some results concerning the application of comparison theorems to the non-linear equations arising in this topic and also the transient analysis of such systems.

(b) K. Micka (Heyrovsky Institute of Polarography, Prague) presented experimental results to substantiate his model of porous electrodes of second order that considers, apart from the usual two systems of pores (larger gas-pores and smaller flooded-pores), very fine pores due to the catalyst particles and flooded with electrolyte.

The problem of relating the local current density potential relationship (micro-kinetic) to the experimentally accessible current-potential curves (macro-kinetics) in the flooded porous system, assuming limitations due to the mass transfer of the reactants and products was discussed in detail by I. G. Gurevich (Heat and Mass Transfer Institute, Minsk, USSR).

(c) The statistical aspects of the capillary equilibrium as a basis for test of models was considered by Yu. A. Chimadzev (Academy of Sciences, USSR).

(d) M. Bonnemay and G. Bronoel (Laboratoire d'électrolyse du CNRS, France) discussed

about the triple contact electrodes and the possible future role of dispersed or suspension electrodes in electrochemical power sources. The need to tackle urgently the problems of education, training (and attitude) and needed directions in basic research as well as perspectives on the future of electrochemical energy conversion and storage were stressed by J. O. M. Bockris in his address (Tables III and IV).

TABLE III

(due to J. O. M. Bockris)

*Some peculiar priorities (1969 \$ millions)*

Battery Research—All U.S.	..	5
Fundamental Electrochemistry—Research	..	1
G.M. Anti-Pollution Research	..	8
N.A.P.C.A. Total Budget	..	112
G.M. Advertising	..	240
Model Change, Car Companies	..	2000

TABLE IV

(due to J. O. M. Bockris)

*Some peculiar priorities  
(Ph.D.'s per year)*

All Chemistry	..	c. 2000	(U.S.)
Electrochemistry (1969)	..	5	(U.S.)
		10	(U.K.)
		26	(Germany)
		52	(U.S.S.R.)*

\* Equating Kandidat degrees to U.S. Ph.D.

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## SOIL-BASED IRRIGATION FOR MAXIMISATION OF CROP YIELDS WITH A GIVEN UNIT OF WATER

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IT is well known that over 35% of the irrigated lands of the world have either turned saline or alkali, due mostly to injudicious irrigation and inadequate drainage (Dakshinamurti, 1962). Irrigation water has become a precious commodity all over the world, more so in the tropics and developing countries. Although extensive investigations have been carried out on the irrigation requirements of crops, the concept has all through been in supplying certain quantities of water based mostly on the agronomic observation of the water requirements of crops. The water-holding capacity of

the soil which plays an important role in preserving the water and supplying it to the user—the plant, has never been kept in mind. This resulted mostly in the loss of water by percolation and leaching of nutrients from the soil. It is, therefore, thought desirable in the present investigation to find out the amount of water held in the first 30 cm of the root zone at the field capacity and give new concept to the quantum of irrigation water given per hectare.

Two promising varieties of wheat, namely, Sarbati Sonara, a two gene dwarf and I.I.D.

1955, a triple gene dwarf, were grown on a statistically-laid field experiment on alluvial soil of the Indian Agricultural Research Institute Farm, New Delhi. Optimum doses of fertilisers, as recommended by the Agronomy Division, were used in the present investigation. Four irrigations, including an irrigation at the crown root stage, as recommended by the irrigation specialists, were given during the crop growth. At each stage of irrigation, the quantity of water given varied from  $\frac{1}{2}$  field capacity to three times field capacity at six levels, namely,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $\frac{3}{2}$ , 2 and 3 times field capacity values respectively. Controlled field with no irrigation, except the pre-sowing irrigation, was kept side by side.

Figure 1 gives the grain yield of Sarbati Sonara in quintals per hectare obtained with different quantities of irrigation water given. It may be seen from the figure that the yields were highest between  $\frac{3}{4}$  field capacity and one field capacity of irrigation water given.

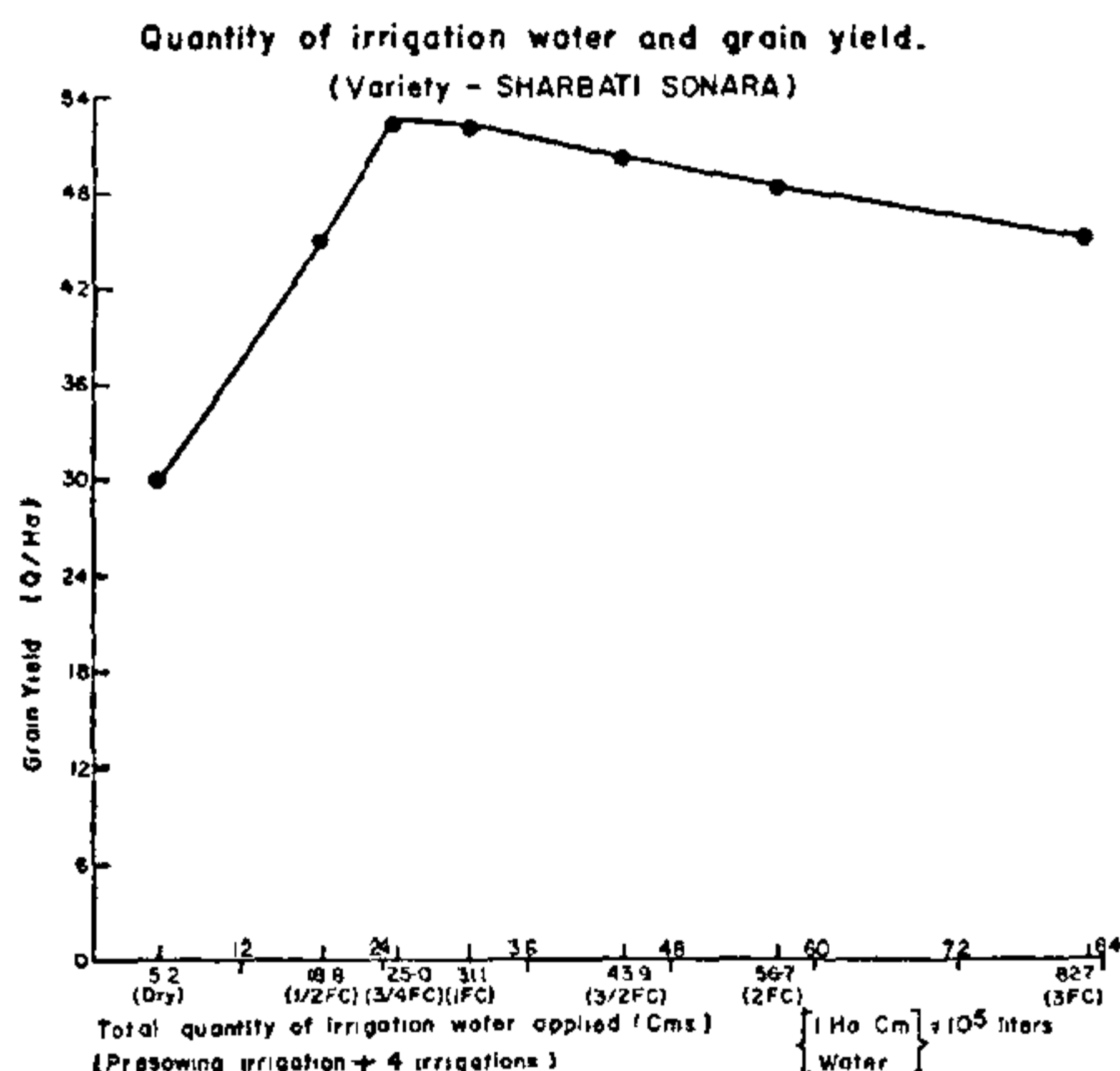


FIG. 1

Figure 2 gives the yield of triple gene dwarf under similar conditions of irrigation given. The results are almost the same as in the case of Sarbati Sonara, namely, that between  $\frac{3}{4}$  field capacity and 1 field capacity of irrigation water given, the yields reached the maximum value.

It appears from Figs. 1 and 2 that the capacity of the soil to hold the water and hand it over to the plant is more important in maximising yields than the variety of the species, although they are known to have their own characteristic root pattern (Dakshina-

murti, 1969; Subbiah et al., 1968). Irrigation rate at three times field capacity has done more harm to the soil and crop than good. This amount of water, if distributed at the rate of  $\frac{3}{4}$  field capacity, can easily cover about four times the cropped area with higher yields per hectare. Thus, if it is required to maximize the yields with a given unit of water, it seems necessary to take that much of area for cropping on which the irrigation can be given each time at the rate of  $\frac{3}{4}$  field capacity of the soil. Thus, knowing the soil characteristics, it is now possible to allot the area of cropping for maximisation of yields with a unit quantity of water given.

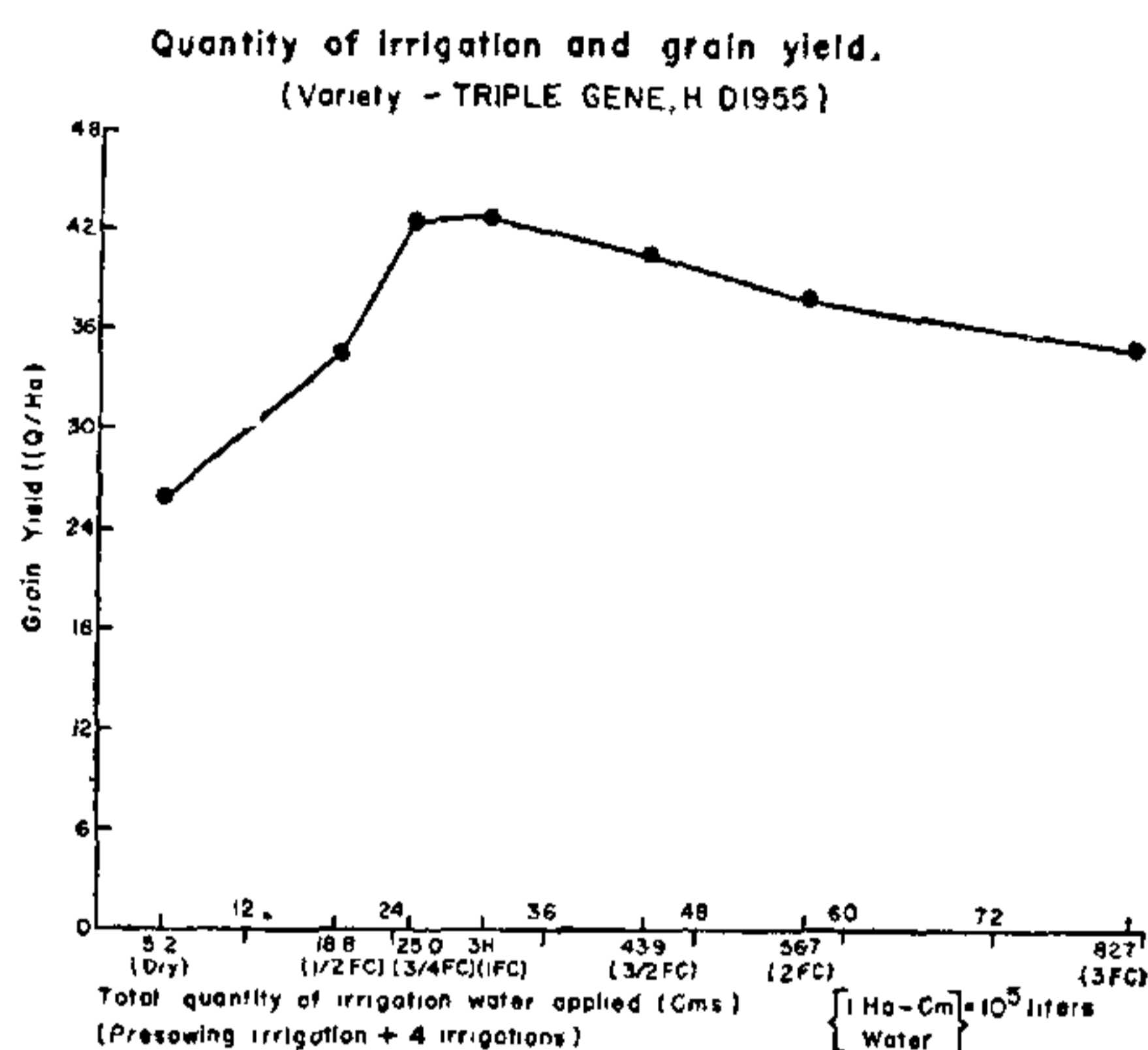


FIG. 2

A question naturally arises, how the fertiliser is being distributed in the root zone under the different quantities of irrigation water given? Figure 3 gives the mineralisable nitro-

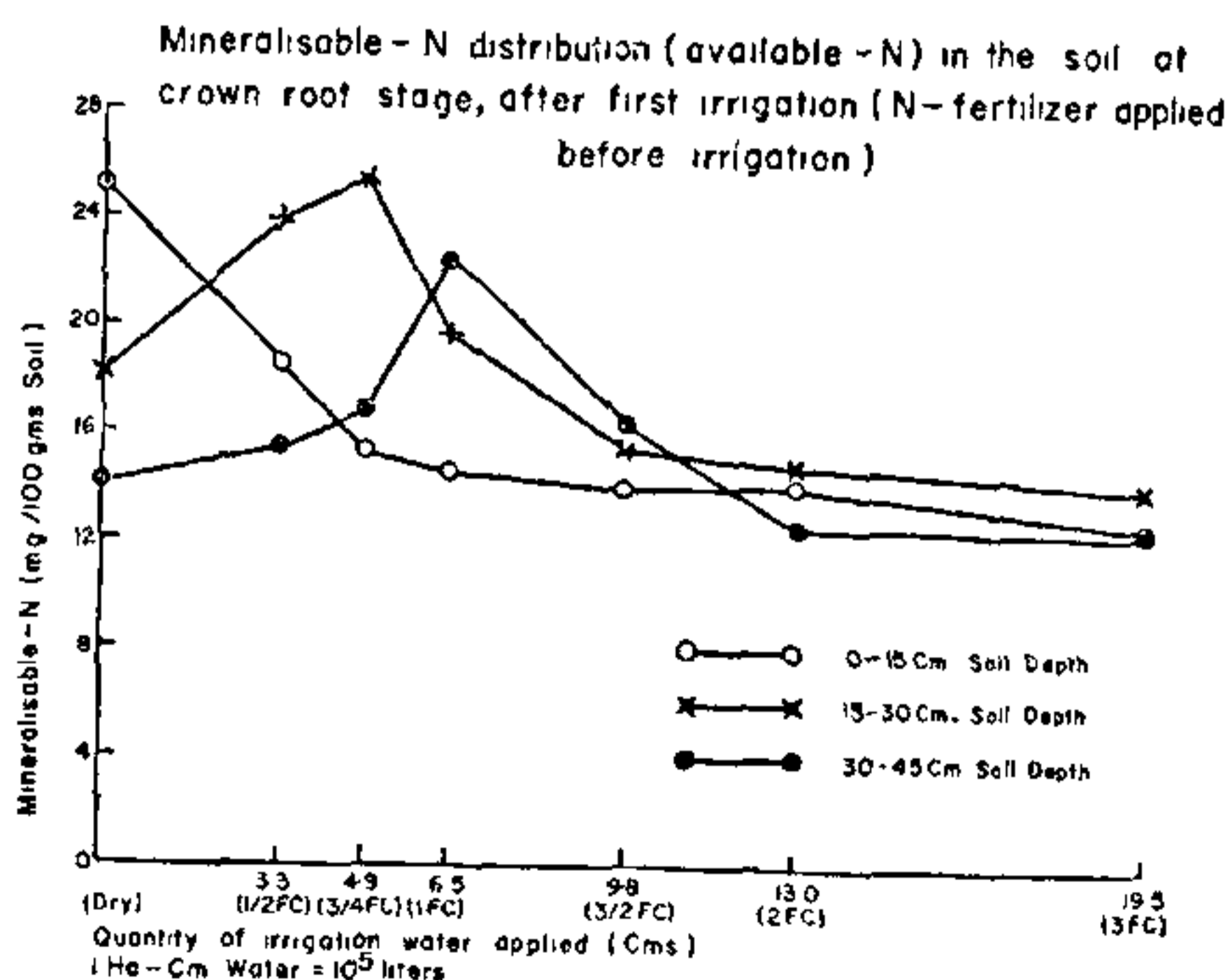


FIG. 3

gen distribution in the soil at crown root stage after the first irrigation. It is seen from the figure that at  $\frac{3}{4}$  field capacity irrigation rate, the mineralisable nitrogen in the 0-15 cm top layer decreases by leaching to about half the original value of nitrogen, while this leached nitrogen gets accumulated in the 15-30 cm layer. At 30-45 cm soil depth, the mineralisable nitrogen has a maximum value at one field capacity level of irrigation water given. For higher values of irrigation rates, the nitrogen gets lost from the root zone. In the case of wheat, about 60% of the root system is known to spread mostly between 15-30 cm depth and about 20% extend to the subsoil region 30-45 cm (Arora, 1969). If the irrigation schedules are restricted to  $\frac{3}{4}$  field capacity and one field capacity, most of the mineralisable nitrogen will be available to the roots resulting in maximisation of yields.

Further work on the benefits of water harvesting technology coupled with irrigation schedules based on soil characteristics is in progress.

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## INFECTIOUS BURSAL DISEASE IN CHICKENS

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### INTRODUCTION

**I**NFECTIOUS bursal disease (IBD) is a viral disease generally affecting young birds upto six weeks of age causing high morbidity but low mortality. Infectious bursal disease or "Gumboro disease" was first recognized and reported in the U.S.A. by Cosgrove (1962) in 1957. Winterfield et al. (1962) have isolated the infective agent and differentiated it from the nephrosis syndrome caused by certain variant strains of infectious bronchitis virus (1962). Subsequently, the disease has been reported from U.K. (Barron, 1966), Israel (Meroz, 1966), Germany (Landgraf et al., 1967), Netherland (Lensing, 1968), Spain (Badiola et al., 1969), France (Maire et al., 1969), and Puerto Rico (Bond et al., 1970). Report on the occurrence of this malady in Asiatic countries including India is not available in the literature.

The present report deals with the occurrence of IBD in India and patho-anatomical changes encountered in natural and experimental cases.

### MATERIALS AND EXPERIMENTAL PROCEDURE

During routine post-mortem examinations and materials received from the field, several specimens of bursa Fabricius were collected

usually from young growing birds of about 3 to 6 weeks of age. A few specimens of bursa Fabricius were collected aseptically and a 10% saline suspension was made of the involved bursa. The suspension was either filtered through bacteriological filters or treated with antibiotics (10,000 units of penicillin and 10 mg of streptomycin per ml of the bursal suspension) before inoculation into the susceptible chicks. Three-week-old chicks were inoculated intraperitoneally with 0.2 ml of treated material and simultaneously given a drop of inoculum on the eyes and nostrils and eight serial passages were done. Nine-day-old embryonated eggs were inoculated via allantoic cavity with the treated bursal suspension and five serial passages were done using whole embryo suspension.

Parts of the bursa Fabricius from natural cases as well as from experimentally-infected birds were fixed in 10% formal-saline and processed for routine hematoxylin and eosin staining (H.E.). Histochemical staining was done for the presence of mucin and connective tissue by Alcian blue and periodic acid schiff reaction (PAS) and Masson's trichrome staining technique respectively, in a few selected