INTRODUCTION

Jute cultivated for 'the golden fibre' is predominantly a crop of the Indian sub-continent. From Appendix I (FAO, 1980), it is seen that India, Bangladesh and China accounting for 30, 26 and 27 per cent of the total world production of 3.8 million metric tonnes of raw jute and allied fibres. Other principal producers of these fibres are Thailand, Burma, Brazil and Nepal.

From Appendix II (FAO Production Yearbook, 34, 1980) it is seen that between the period 1969-72 and 1980-1981, India increased its total production of jute through increased area as well as higher per unit area production. It is also noticeable that during that period almost all the jute producing countries achieved increased yields from unit area. The performance of China in this regard is spectacular which was able to raise its per ha yield of jute fibre from 2354 kg (1969-72) to 4066 kg (1980). The achievement of Bangladesh too in this connection is better than that of India. While Bangladesh was able to increase its per ha yield of jute from 1270 kg (1969-72) to 1389 kg, India had to remain satisfied with increase from 1087 kg to 1177 kg during that period. In Appendix III are given more statistics regarding the jute scene in India. It is seen that over the years the area under jute cultivation, despite small fluctuation, has remained almost the same. Production of jute fibre per unit area has
increased from 1186 kg/ha (1970-71) to 1470 kg/ha in 1983-84. As a result, total jute production in 1983-1984 was up by more than 1 million bales over 1970-1971 production despite slight lowering of area under jute.

Summing up, one is led to conclude that there has been some improvement in the production technology of jute in this country but it has got to go a long way in attaining spectacular per unit area yield of China.

But the sooner can India attain higher productivity, the better in view of certain considerations.

According to Ghosh (1983) while Bangladesh and Thailand are the largest exporters of raw jute fibre, India and Bangladesh are the largest exporters of jute goods accounting for 30% and 40% respectively of total world manufacture of processed jute products. India has got a large jute processing industry and the jute mills can work only during a part of the year due to limited production of indigenous jute. Of late, attempts have been made to run the Indian jute mills for longer periods with imported raw jute fibre.

Long term import of substantial amounts of raw jute to keep the Indian Jute mills running seems untenable as this will mean the ransoming of Indian jute industry to the raw jute exporting countries. At one end thus is the insufficient indigenous jute production to keep the wheels of Indian jute industry rolling
while at the other end is the steady decline in export of jute and its products. According to Ghosh (1983) the net exports of jute and fibres (including goods) from the producing countries of India, Bangladesh and Southeast Asia dropped from 2.1 million tons in the early 1960's to 1.8 million tons in the early 1970's and 1.5 million tons in 1976-78. The competition from substitutes of jute in manufacturing bags (major manufactured product of jute is gunny bag) which has been partially responsible for decline in export of jute and jute products is likely to increase in future holding out a bleak prospect for Indian jute industry. Moreover, China with its impressive achievement in the field of jute production is already posing a serious rival to India in export of jute based products to the international markets.

Jute industry is a labour intensive one. To sustain the employment of the huge labour force, we have got to ensure increased jute production inside the country so that full production potential of the jute mills can be realized.

Increasing the area under jute production is not possible or the scope of doing so is marginal. The remaining alternative is through increase in per unit area production. Jute crop requires fertile soil, suitable climate and adequate rainfall for luxuriant growth and good fibre production but these environmental parameters are beyond control. Input of good seed, adequate fertilizer and plant protection measures can, however, go a long way in increasing jute production.
The present work deals with the second area of the above.
In view of the fact that nitrogen increases the length of the stem which yields jute fibre, the positive effects of nitrogen fertilizers on jute yields have been noted by many workers (Finlow 1921; JARI Ann Rpts. 1948-49; 1949-50; Dargan, 1971). The two species of cultivated jute have also been found to respond differently to nitrogen (J-A-R-I Ann. Rpts., 1969).
Reports of the Jute Research Lab. (1940-47) indicate K and Ca to be without any direct effect on yield; in red soil, P also had no effect. Ghosh (1983) cites data to show that jute varieties JRO 632 and JRC 212 responded only to increasing levels of nitrogen but not phosphorus and potassium. He also however adds in that in some cases Ca, P, K, Mg enhances the yield increase by N levels.

We know from Liebig's Law of Minimum that the nutrient element which is available in least quantity determines the growth of the plant. Over the years, in India, the accent has been on NPK fertilization to maximize yield. Prolonged cultivation with the input of those elements alone will entail largescale removal of secondary and trace elements. Where the cropping intensity is high, depletion of secondary and trace elements will be more rapid. In case of jute, removal of K₂O, CaO, MgO by capsularis jute, variety JRC 212 has been found to be 77.45, 119.63 and 49.09 kg/ha (Mandal, 1964). In case of olitorius jute cv. JRO 632, the
Prolonged cultivation of crops without any input of secondary or trace nutrients will lead to their deficiency. The availability of high analysis fertilizers with little contamination has further heightened the problem. It is also well-known that for best crop response all the nutrients should be present in soil in balanced amounts and any departure from it, be it adequacy or deficiency of a single element, will not only affect crop growth and yield but also will bring about a shift in the requirement of others (Smith, 1974). Obviously, this alone has led to difficulty in interpreting fertilizer responses of crop plants to nitrogen, phosphorus and potassium fertilizers.

Since the enunciation of Liebig's Law of Minimum it has become well known that in any crop production program, fertilizer application is necessary. In any fertilizer program fertility of the soil vis a vis the fertilizer nutrient, and crop removal of that element are carefully evaluated in order to evolve a rational fertilizer schedule.

Since the middle of the nineteenth century, chemical factors of soil fertility have been sought to be evaluated by laboratory determinations. The current concept of evaluating soil fertility involves the determination of so called 'available nutrients' by arbitrary extractants and finding out whether there is any relationship between available nutrients on one hand and
nutrient uptake and crop response on the other. Unfortunately, however, often no relationship between soil nutrient status and crop response has been obtained. Thus while, on one hand, potassium responses have been noticed in soils with high available K status, on the other hand little response or even negative response have been obtained on soils of poor K status. The frustrations of scientific workers regarding soil test - crop response studies have been aptly expressed in the words 'unless an approach capable of universal application is adopted, the future of soil testing will consists of an endless series of fertilizer trials designed for correlation with an ever increasing number of hit or miss extractions' of Nye (1963).

The growing uncertainties regarding the suitability of soil fertility assessment studies led to the application of principles of physical and colloid chemistry in determination of various thermodynamic functions like free energies of replacement potentials, activity ratios etc.

In recent years, both in India and abroad, lot of interest in the activity ratios of $K^+$, $Ca^{2+}$, $Mg^{2+}$ in the soil have been evinced in order to describe soil - plant relationship in respect of them.

In view of the fact that $K^+$, $Ca^{2+}$ and $Mg^{2+}$, are the three dominant cations in the soil and they interact with one another in the soil (Al-Badrawy and Bussler, 1968; Tewari et al., 1971;
Dijkshoorn et al., 1974; Schuffelen, 1974 etc.), the present work was taken up to study the effects of K x Ca x Mg levels on growth, yield and nutrient uptake by *capsularis* (JRC 212) and *olitorius* (JRC 632) jute in pot culture experiments over 2 years, using soils of jute fields having cropping intensities of 200–300 per cent.

Selected treatments were analysed for their Q/I parameters and attempts were made to correlate them with crop growth and nutrient uptake.