CHAPTER 1
Ever since the birth of civilisation, food plants have received the attention of thoughtful men, whose main concern has been the improvement in their yields. In recent times, this aim has been achieved by farm scientists in a big way. The multi-disciplinary approach based on the team work of breeders, agronomists, physiologists and others has resulted in the evolution of varieties that yield several times more than the traditional ones. In fact, so many new varieties of important food plants, particularly cereals, are released for cultivation every year, with many more in various stages of testing in the laboratories, that one is reminded of an "assembly line".

An inherent impediment in the large-scale cultivation of these new varieties in developing countries is their requirement of high doses of fertilisers for optimum performance. The average farmer finds himself handicapped by the high cost of fertilisers and other inputs. Under the circumstances, he either lingers on with the older varieties, inspite of their lower yields, or provides sub-optimal doses of fertilisers to the new varieties. The result in both cases is a drastic lowering of the gross national target of food production. Multi-pronged efforts are being made at all
levels to improve the situation. The Government is using persuasion, incentives and even deterrents on the side of the farmer and is taking measures on its own side, to cut down prices of inputs as well as to make them more easily available. The agricultural scientists are also trying to help by exploring ways and means to economise on the inputs while maintaining the yields.

At Aligarh, Afridi and co-workers have made significant contributions in this endeavour during the last few years. Schedules have been worked out for saving large quantities of fertilisers by replacing them with only a small fraction applied as solution to the leaves at appropriate stages of growth, at the same time maintaining high quality and yield of a number of crop plants including barley, wheat, maize and vegetables (Afridi and Samiullah, 1973 a,b; Samiullah and Afridi, 1975; Khalique, 1975; Qaseem, 1975). However, the present author thought of a different approach for achieving the same goal. He argued that if root growth of seedlings could be enhanced by appropriate seed treatment they would have a better chance not only of establishing themselves in the soil but also of absorbing more nutrients and water. This would be expected in turn to increase shoot growth and finally yields. In preliminary screenning, seeds of a number of crop plants were soaked in aqueous solutions of various growth promoting substances, including phytohormones and vitamins.
After germination in petri dishes for a few days, it was noted that pre-treatment with pyridoxine (Vitamin B₆) effected visibly better growth of roots as compared with that of the controls whose seeds had been soaked in water. Out of the plants tested, barley was selected for further studies on account of a number of reasons. It is one of the important cereal crops of India covering more than two million hectares (Anonymous, 1975) of which almost two-third lies in the state of Uttar Pradesh. It is adaptable to adverse environmental conditions. It is extensively consumed as food and fodder and is also used in the malting and brewing industry. Moreover, experience at Aligarh had shown that it grew very well under local conditions.

Having achieved better root growth in pyridoxine treated seeds, the next step was to test the theory further by growing them to maturity in sand culture, confining the experiment to K 572/28, the best responding variety of barley. The data of this experiment showed that pre-treatment of grains with pyridoxine significantly enhanced root and shoot growth as well as yields by promoting many of the vegetative and ear characteristics in this variety.

The results of this sand culture experiment encouraged the author to adopt large-scale cultivation of treated grains in the field taking more varieties of barley. As a measure
of economy, the effect of rice bran, a cheap source of pyridoxine, was also investigated.

The following field experiments were performed on barley to study:

The effect of pre-treatment of grains of five high yielding varieties, namely NP 13, NP 21, K 572/10, K 572/23 and Clipper, with pyridoxine solutions of varying concentrations.

The effect of pre-treatment of grains of two sister lines namely, K 572/10 and K 572/23, with varying concentrations of aqueous rice bran extract.

The effect on variety K 572/23 of solid rice bran added to the soil with full or half the recommended fertiliser dose with an eye on fertiliser economy, and

The effect of foliar application of rice bran extract using variety K 572/23.

The statistically analysed data obtained in these five experiments and the conclusions drawn from them are presented in this thesis.