CHAPTER-1

INTRODUCTION

There is strong global awakening lately to ensure proper management of the existing resources so as to make them long lasting for the benefit of mankind. Certainly, this has been necessitated because of population increase at an alarming rate. It is realized now that our resources are limited and should, therefore, be utilized properly so that they may remain available to future generations. On the other hand, their by-products should either be degraded or recycled without creating any extra burden in various terrestrial and/or aquatic eco-systems.

Recent scientific advances in plant nutrition and fertilizer application have revolutionized crop production. Natural organic and inorganic substances are the primary sources of plant nutrients. Supplementation of natural fertility with commercial fertilizers is a profitable agricultural practice. With the demand for food increasing alarmingly, more and more land is being brought under cultivation, increasing the demand for fertilizers as well as irrigation water. Hence, the focus is shifting towards various non-conventional sources. Among others, one of the important irrigation as well as nutrient source is municipal wastewater, which carries about 99% water and the rest as
organic and inorganic materials. Moreover, the ever-increasing prices of commercial fertilizers and problems connected with wastewater and sludge disposal together with improved sewage handling techniques have made sewage water increasingly attractive to meet the twin objective of nutrition as well as irrigation inexpensively. Indian farming being largely dependent on the vagaries of the monsoon, due to which seasonal distribution of water is highly uneven, the farmers of modern India are willing to opt for greater use of such wastewater, wherever available.

Millions of litres of sullage and water are discharged as sewage and may be used for irrigation purposes. Since its disposal is a big problem in itself, applying sewage effluent to the fields, instead of dumping it in water bodies can make crops grow better due to the presence of various essential nutrients (Henry, 1954; Hershkovitz and Feinmesser, 1967; and Josef and Feinmesser, 1977).

However, before making any generalization, certain questions require positive answers. For example:

1. Is it feasible to distribute sewage effluent on the land safely and in all seasons?
2. How much will the soil renovate the effluent? and
3. How will the effluent affect soils and crops?

The earlier researches have revealed that:
1. Land filters effluent safely under proper management.
2. Irrigation is possible in all weathers.
3. Soil filters upto 99% of nutrients.
4. Over 80% of the effluent water returns to the groundwater.
5. Frequent harvesting improves renovation.
6. Nutrients present in wastewater are utilised effectively.
7. Effluent stimulates growth of plants.

Chemical analysis of sewage water shows that many of the essential nutrients are present in it. The nutrients in reclaimed municipal wastewater provide fertilizer benefits to crops. But in certain instances, nutrients are in excess of plant needs and cause problems related to excessive vegetative growth, delayed or uneven maturity or reduced quality. A periodic check must be made to estimate the amount of nutrients being applied. These amounts should then be included as part of the fertilization programme (Overman, 1979 b; Kumar et al., 1984; Veer and Kusumlata, 1987).

Sewage also contains micro-organisms and is a medium for their dissemination. It has now been established (Feachem et al., 1983) that raw wastewater from a community usually carries a wide spectrum of pathogenic bacteria, viruses, protozoa and helminths which are excreted by those suffering from, or by carriers of, the particular diseases endemic in the community.

Therefore, although the use of reclaimed water offers the potential for exploiting a "new" resource which can be substituted for existing sources, it must be approached with
caution. Current concern about environmental quality requires a more responsible approach to effluent reuse so that both health risks and costs are minimized. Therefore, it is necessary to minimize the exposure and reduce the health concern in proportion to the degree of human contact with the effluent, the quality of the effluent, and the reliability of the treatment processes used to treat the wastewater before reuse.

Triticale, a hybrid of wheat and rye, combines the high productivity and protein content of wheat with the vigour, hardiness, resistance and lysine content of rye. With its high yield (Inam, 1978) and nutritional value (Villegas, 1973) and wide range of adaptability (Hulse and Spurgeon, 1974). This new crop deserves to be given due place both in the laboratory and field, so that its potentialities as a field crop may be exploited commercially.

In a recent CIMMYT (Mexico) report on wheat improvement (Anonymous, 1988), it was suggested that triticale should be tested and cultivated in major dryland areas in the developing world, particularly North Africa and the Middle East, Central India, the dry areas of Afganistan and parts of Sind and Baluchistan provinces of Pakistan. Triticale is now known to be well adapted to various regions and climates and performs better than wheat in disease prone areas and semi-tropical highlands. At present, it is grown in Argentina, Australia, Brazil, Canada, China, Hungary, Kenya,
Mexico, South Africa, Spain, USA and the erstwhile USSR. In India TL-419 triticale has already been released to the farmers of Punjab. However, it must be admitted that triticale is not yet expected to replace wheat as a commercial crop, although, at present in the best irrigated areas of Sonora (Mexico), the home of the Mexican dwarf wheat new triticale varieties have started yielding as much as the best local wheat check and even better in some cases.

In cereals however, high grain yield is not the only criterion, as nutritional value is equally important. Lysine is the most limiting essential amino acid of cereal proteins and the quality of a protein is generally measured by its lysine concentration. Triticale in general, contains higher grain protein and more balanced amino acid composition of protein, with high proportion of lysine, than wheat.

Recently released varieties of triticale with their improved genetic makeup are being exploited to test their viability for commercially cultivation. Their optimum potential can, however, be realized after determining, by properly laid out field trials, the agronomic practices most conducive to maximum productivity. Plant nutrition is one of the major controlling factors of crop yield and quality among the various agricultural practices and thus demands considerable attention as varieties are known to differ considerably in their mineral nutritional requirements. At Aligarh (U.P., India) a lot of work has been
carried out on the mineral requirements of triticale by Afridi, Samiullah, Inam, Ahmad and their associates.

The present study differs from these earlier studies as it was based on the effect of wastewater and its suitability as irrigant on some selected varieties of triticale, including wheat as check. It may be pointed out that wastewater application to triticale was considered a promising proposal since about 60 million litres of sewage is discharged outside the town limits of Aligarh daily by sewage pumping stations. Keeping in view the above facts, it was decided to conduct the following five field experiments on triticale:

1. To study the effect of sewage wastewater and groundwater irrigation on growth, yield and quality of five triticales and a wheat check at three growth stages.

2. To study the effect of sewage wastewater and groundwater irrigation at six doses of basal nitrogen on growth, yield and quality of triticale variety TL-419.

3. To study the effect of four nitrogen doses on growth, yield and quality of two triticales and a wheat check, irrigated with sewage wastewater.

4. To study the effect of four phosphorus doses on growth, yield and quality of two triticales and a wheat check, irrigated with sewage wastewater.

5. To study the effect of ten combinations of N and P on growth, yield and quality of two triticales (TL-419 and Juppa'S') irrigated with sewage wastewater.