Chapter I

INTRODUCTION

Wide spread occurrence of second-generation problems such as population explosion, over mining of soil nutrients, decline in factor productivity, reduction in profitability, lowering of ground water tables and build up of pests including weeds, diseases and insects has been reported during post-green revolution era in most of the intensively cultivated high productivity cereal-based production systems, which are threatening the entire eco-system in general and food security system of the nation in particular along with the sustainability of the agricultural production system. The research results during the last two decades have clearly established that these adverse impacts of green-revolution technologies may be mitigated through an appropriate choice of alternative crops and cropping systems, which are efficient user of resource base (land, light, water and energy), economically more remunerative and environment friendly. An adoption of well-designed situation-specific alternatives cropping systems along with appropriate method of cultivation could minimize the occurrence or intensity of diseases and insect - pests, including weeds considerably.

Maize (Zea mays L.) or Indian corn, a staple food of poor is one of the most important cereal of the world and in universal use it out ranks all other crops. Invariably, it is referred to as the “queen of cereals” primarily because of its very high yield potential, suitability for being cultivated all round the year and its multifacet uses.

In India maize on an average is cultivated in about 7.42 mha producing 14.72 mt. of grain having an average productivity around 19q ha⁻¹. Major portion (45%) of maize is consumed as food and additional use of maize includes as feed, forage and in processing industry.
Maize occupies the prime place of importance in irrigated uplands, especially in the plateau region. Sloppy nature of land in plateau region coupled with high permeability of upland soils makes them ideally suitable for maize cultivation. During rainy season wherever irrigation is available, the choice of grain crops is mainly limited to rice and maize. Since, cultivation of rice is limited only to low-lying plane land, the rest of the irrigated upland areas are to be covered with maize.

The yield of maize crops during kharif season is much lower than those harvested during winter and summer seasons. The reasons for this low yield is manifested in infestation of weeds in large number and their luxuriant growth and increased incidence of diseases and pests. So far as control of diseases and pests are concerned, adequate measures are there to take care of them. Thus, it is the weed problem which becomes the barrier in accomplishing the yield potential of maize during rainy season.

Maize being a wide spaced row crop and having a slow growth rate, especially in its early growth stages offers ample opportunity for emergence and growth of weeds. These weeds give serious competition to the crop and utilizes lion’s share of nutrients, moisture and light to the cultivated crop plants resulting their poor growth and development, which ultimately referred in low yields (Porwal, 2000). Of the total estimated losses caused in production by pests, insects, diseases and weeds in the world, weeds alone are responsible for one – third of it. (Saraswat et al., 2003).

Our agricultural production system is presently in a state of ecological degradation. The productivity, profitability, stability and durability of the system is being seriously threatened by the excessive use of high analysis inorganic fertilizers and toxic substances as plant protection measures. Thus, a restrain in the use of such chemicals necessitating their judicious and need based application and that too wherever no alternative is in sight, is the demand of the day. On the other hand high cost involved in manual weeding,
dearth of labourers, when really are on demand and at times no soil workable condition due to incessant rains makes it imperative to opt herbicidal control of weeds particularly in row crops.

Under the situation referred above the concept of intercropping offers ample scope for combating weeds (Willey, 1979) without any threat to ecological degradation. Intercropping especially cereal + legume combination can increase production and productivity by better utilization of resources and thereby minimizes the risks and brings stability under rainfed conditions (Chatterjee and Mandal, 1992).

The crop selected for intercropping with the primary intention to control weeds should be quick in growth habit and they should give almost zero competition to main crops as in case of parallel cropping. Thus, leguminous crops fixing elemental nitrogen for their own appears to be the best for intercropping, which are expected to give minimum possible competition to the main crops rather stabilize the productivity of the system (Umrani et al., 1987; Patil and Patil, 1987). These quick growing legumes are also capable of suppressing weeds owing to their dense crop canopy and better coverage of space (Singh et al., 2005).

Even if some weeds emerges in spite of growing intercrops, the quantum and frequency of herbicide used will be much lower than those recommended in their crops of pure stand. Hence, intercropping may either eliminates the use of herbicides or at least reduces their use considerably.

In the present era of agricultural transformation, intercropping is not viewed only as a tool to combat vagaries of nature but as an efficient and effective practice for yield stabilization and productivity improvement. There are ample instant as to establish that a large number of crop combination as intercrop can give higher yield and return as compared to their pure crop (Willey, 1979).
Hence, intercropping has been proved to be an effective and efficient tool with the help of which a war on poverty, unemployment, food and nutritional insecurity can be wined. Therefore, intercropping of legumes like soybean and groundnut in maize is not only expected to control weeds but it can also enrich the soil health for sustaining the production and productivity for longer period of time.

Weed management research in India has been mainly confined to sole cropping (Gupta, et al., 1968) and the information relating to weed control in intercropping system is rather meager (Enyi, 1973). So there is strong need of research on weed management in intercropping system taking pulses and oilseeds as a component crop to meet the demand of cereal, pulses and oilseeds to provide balance diet for achieving food and nutritional security of the nation.

With these view under considerations the present investigation has been taken entitled “weed management in maize (Zea mays L.) based intercropping system” was carried out with the following objectives.

- To determine the effectiveness of intercropping system in controlling weeds in maize.
- To find out the most effective intercropping system for control of weeds in maize.
- To find out the most effective herbicides in controlling weeds in pure stand of maize and also in maize – based intercropping system.
- To find out the quantum of nutrients (NPK) removed by weeds in pure stand and in intercropping system.
- To evaluate the economics of treatments used for managing weeds.