GENERAL INTRODUCTION
CHAPTER - I

INTRODUCTION

Wheat is world's leading cereal crop and is grown over wide areas of the two hemispheres. The cultivation of wheat is over wide range of latitudes 6° N to 45° S. The bulk of its production comes from both north and south hemispheres.

One hardly knows when wheat cultivation began nor it is easy to find out but it is clear that but for wheat, the civilization would not have grown. It is the one crop which alone has the potential to sustain human race in all the regions of the world as it has complete food value that any crop has.

The farmers throughout the world have been growing wheat under different systems in different climatic conditions in different times of ages. However, in last few decades, hybridization, packages of practices and complete choice of varieties have paved a way to the increased productivity. The efforts are still continued towards increased productivity. However, the picture looks bleal as a whole and probably the production is unlikely to keep pace with increasing trend of populations in the times ahead.

In India, its cultivation is confined to the rabi season of the year. The country ranks fourth among wheat growing countries of the world contributing 9% of the total wheat produce. (wheat, ICAR, 1985 FAI).
The scientific study on improvement of wheat quality began with the establishment of I.C.A.R. In the year 1955, collaborative studies between breeders and pathologist of I.C.A.R. brought an outstanding disease resistant variety N1-809 for all the three rusts.

A laboratory at Layalpur (now in Pakistan) under ICAR determined the milling and bread making qualities of Indian wheat. The wheat areas were supported by ICAR and All India Coordinated wheat research program was launched for getting high yielding varieties.

The visit of N.E. Borlaug introduced semi dwarf varieties Lerma Rojo, Sonora cv 18, 5306, and 68 lines were brought from CIMMYT, Mexico at PAU Ludhiana and Pantnagar. Selections were made amongst the lines and new varieties were grown and released. Then Kalyan Sona, Sonolila, Safed Lerma, Chhoti Lerma were evolved followed by sharbat1 Sonora and Gold amber. Grains traveled across sea and oceans, shuffled crossed and recrossed in laboratories from Mexico to the ends here in Indian fields which eventually gave wonder grain varieties that changed the whole complexion of life of farmers as yet no crop has done before.

Out of S-227, Kalyan Sona was developed at IARI, Sonolila out of S-306, safed lerma from S-307 and Chhoti Lerma from 331. The varieties were released in 1967-1968. The yield reported were three times higher over Indian tall varieties. The cultivation of two gene dwarf gave bumper yield. Three gene dwarf HERA was released in due course. A
new T. durum was later released for Maharashtra and Madhya Pradesh. A ball was thus set rolling for breeding new varieties till today.

The average yields of wheat in India were reported 18.30 Q/ha, although as high as 36 Q/ha yields have been reported by individual farmers. The average yields in Punjab state have been reported to the extent of 40 Q/ha which indicated that a significant potential exists therein for further improvement in the yield levels. The growth of the crop largely depends on climate, nutrient supply, weed free conditions and agromanagemental practices when provided in balance, the crop grows well and splendors a process that ensures the yield at its best.

The cultivation of HYVS (High Yielding Wheat Varieties) in India thus stepped up the yield levels. In the year 1964-65, 12.5 t grain yield /ha was the best in any years before. But with the improved cultivation techniques, wheat yield doubled in the past few years while phenomenally yields reached a peak of 42 m tonnes in the year 1987-88 (wheat, ICAR 1985). The yield rate remained stagnant in 1978-79. However, showed an increasing trend after 1980's. This was mainly due to adoption of different practices of cultivation and the varieties.

In general, it was observed that the yields at national demonstration levels were very high when compared with the yields recovered on farmers fields. This indicated that wheat has a potential to further up yield, if concerted efforts are taken by adopting new methods of cultivation,
use of high yielding varieties and plant protection measures.

The introduction of high yielding dwarf varieties of wheat has brought a success to the green revolution in India (Swaminathan, 1965). The progressive yield increase per hectare is much more gratifying in Punjab, Haryana and U.P. is yet another feature added to the success of green revolution in India.

With the help of CIMMYT in India, new wheat varieties were evolved at IMWIP, ICAR and IAPI, New Delhi which made a significant contribution towards maximization of yield under Indian conditions. The work is being conducted at 50 research centers in different parts of the country.

The extensive studies conducted at different centers were of multi-disciplinary type such as agronomic practices, control measures of weeds, diseases, pests, physiological efficiency and other attributes were aimed towards yield improvement.

The studies on different disciplines were coordinated together on a common platform to discuss and execute the planned work for increased production in different regions of the country.

Several, ICAR projects provided informations on the adoption of agro-management practices, the long term fertilizer usage, micro nutrients, water technology and dryland cultivation of saline areas in different parts of country.
The scientific endeavors thus added towards increased productivity in terms of increased area and quantum yield jump/ha. This marked the success of extensive efforts and technological progress achieved in different areas of wheat cultivation.

In Maharashtra, wheat is grown over a wide range of soils and agroclimatic conditions. In the Marathwada region of the Maharashtra State, in the early years of 1950-60s the cultivation was confined to the areas where irrigation facilities were available. However, in recent past owing to increased irrigation facilities and introduction of high yielding dwarf genotypes, the cultivation has increased for better economic returns.

It has been the experience that ever since, the farming of food crop began, the influence and impact of weed on grain yield has been persistent as they persuade, compete and mask the growth of crop and thus lower the yield potential. The weeds mainly compete with crop for space, light, nutrient, water, minerals of soil and cause overriding effect and exceed the crop growth.

Weeds make the harvest difficult either by entangling or by overgrowth. They contribute to holding moisture in crop, harbour fungi, insects and produce infectious diseases in grain (Manus, 1973).

In last two decades, the techniques have revolutionized the agriculture in all the crops. The improved breeding techniques in Wheat, use of crop protection measures such as weed control were on the frontlines to achieve yield maximization. Thus in particular, the control of weed is imperative and is
a most common problem for every crop during cultivation, "A plant out of place, undesirable, pernicious or that interferes with agricultural operation or yields and adds to the cost of cultivation has been regarded as weed. (Hanus, 1973)

The weed growth not only depends on the characteristics and habit but the relative position with reference to crop is important. They cause serious problem to crop, their survival is mainly because they have wide range of tolerance and resistance to agroclimatic conditions and are always ahead of crop.

It has been found that most of the weeds propagate by seeds or by livestock, their growth can be kept under control by better cultivation management allowing the crop to grow faster. However, a few noxious weed needs attention, since they inflict losses and add burden to the cost of cultivation.

Extensive weed survey and planned efforts to know about composition and control of weed flora of a region is a prerequisite. The composition of weed flora is however, never stable, new weeds invade and complicate the situation, particularly when intensive weed control operations are practiced. Weed management at times cause shift and migration of weeds to newer areas causing change in weed flora.

The effective weed control needs a long ranged programme covering survey, check on weed growth, safeguard against introduction of new weeds and a workable plan to keep check on weeds movement from one area to another due to migration.
Since crop and weeds grow simultaneously utilising the resources available under similar set of field conditions and any drastic control measures would tend to affect the crop as well. This has been more so, when weeds are controlled by the use of chemicals.

The weed control is an integral part of cultivation which covers farming system, crop rotation and agricultural structure in relation to agroclimatic conditions of different regions. The topographic and environmental variations call different concepts of protection measures in an integrated crop cultivation system (Buchel, 1984).

In the olden days, control of weed was done exclusively by mechanical ways, largely by harrowing, raking and hoeing. Even still today, the practice is prevalent. The crop rotation technique of the past does have relevance in present situation. The conventional methods of weed control are extensively practiced to keep off weeds. However, have their own limit and eventually failed in the face of intensive agricultural systems. The alternatives were sought to control weed by the use of chemicals.

The chemical weed control which began as early as in 1941 in U.S.A. with the introduction of 2,4-D (2,4, Dichloro phenoxycetic acid). It was found that most of the chemicals used have preferential action as selective weedicides and their application helped to reduce weed number in fields of wheat and maize. The use of 2,4-D obviously was common practice to keep weeds in check (By 1950 in U.S.A.). The selection and use of different weedicides began as a practice to control
weeds to the extent of 60% to 65% in different fields which nearly covered about 50% of the agricultural area. Thus chemical weed control to a large extent succeeded in replacing mechanical weed control, it proved economical, labour saving and obviously rendered indispensable in the developed countries.

The adoption of new methods of cultivation technology, increased use of fertilizer, contributed to weed shift and increased the dimension of weed problems. The situation thus complexed and led the researchers to look for new turn and introduced new type of chemicals based on new principles to attack the photosynthetic apparatus (PSA). This led to the introduction of new chemicals to replace 2,4-D as an effective weedicide.

The role of such chemicals as weed control largely depended upon the response of plant and the action of (ai) of different chemicals, their concentrations and modes of application need be reckoned.

The advances in agriculture and technical expertise succeeded to introduce new herbicides as early as 1960s in order to overcome the acute paucity of labour.

Most of the herbicides now in use have been grouped on basic chemical structure as:

1. Chlorophen; : acetic acid
2. Nitrophenol
3. Carbamates
4. Ureas
5. Pyradinones
6. Synthetic triazines
7. Dihydryls.
The herbicidal binding activity depends on the toxic levels of concentrations, the method of applications and active ingredient (ai), since each plant is destroyed at a particular level of concentration or (ai) of a chemical. It is, therefore, necessary to investigate herbicidal activity on the physical and physiological stages of the crop at different locations.

The selection of a safe herbicide that deals effectively with weed flora of the crop is essential while consideration of tolerance level in the crop needs careful assessment. The precise application with no mistakes of overdoses or overlaps be avoided critically, since active life of leaf area is limited by water availability than the insurance of herbicidal application which renders unworthy. (ADAS 1984 CD-51; 253)

The standardization test of different chemicals on crops and weeds are absolutely necessary to avoid dangers to yield, quality and environmental hazards. The erroneous wastes due to lack of technical expertise in application might invite number of problems in fields. For effective weed control on large scale, planned operations seems imperative.

Before, the trials are initiated, studies on ecology of weeds deserves careful attention, as regards their adoption, migration and persistence under the set of similar and different agroclimatic conditions.

The use of agro chemicals in relation to the climatic conditions like light, temperature, water, wind, humidity and seasonal changes have impact on
germination, floral production, seed maturity and dispersal. Similarly, water and temperature control the survival of the underground parts of the weeds. Soil fertility, pH, temperature, radiation influences weed population.

The weed survey conducted and the attempts made to classify weeds on different attributes need be taken into consideration such as life span, growth phenomena, seasonal habit and reproduction modes. Weeds are grouped as seasonals like rabi, lharif, biennials, and perennials which obey a system of cycle before suggesting the herbicidal application.

**VIABILITY OF UNDER AND OVER GROUND PARTS OF WEEDS**

The survey work revealed that the annuals compete with crop and produce seeds closely with the life cycle of the main crop or remain in the field even after the harvest such weeds can be easily controlled by mechanical way or by chemical application, since their roots have no power of regeneration. Hence general observation on plant is essential.

The biennials which take two years period to complete their life cycle while Perennials live long, more than three years and unless effective measures are employed their control is difficult.

A preliminary survey of 25 farmers field was carried out in the wheat fields around 25 km area of Nanded in the years 1983-84 and 1984-85. The observations revealed that climatic and soil conditions favoured luxuriant growth of weed species in different fields of wheat crop.
The extensive study confirmed that the wheat fields have characteristic weeds as regard their life cycle, growth habits and thrust for the competition. The study revealed that number of weeds were in corollary with the crop rather than habitats. The association of weeds with crop was basically due to the methods of cultivation rather than any direct influence of the crop itself on the weeds. The observations are in conformity with Brenonely and Warington (1950).

The weed samples were collected, identified using conventional taxonomic methods. Their relative abundance was measured in percentage in an unit area of wheat fields which indicated the distribution as unit area, unit time.