CHAPTER - I

INTRODUCTION
INTRODUCTION

India is the third largest producer of oil seeds in the world. It ranks first in the production of groundnut and sesame and second in rapeseed and mustard. At present, oil seeds occupy nearly 13.00 per cent of the gross cropped area and account for 5 per cent of the gross national product and ten per cent of the value of all agricultural products. This production signifies an increase of nearly 2.5 times in area, 5 times in production and 2 times in productivity since 1950-51 (Sharma et al. 2004).

Rapeseed and mustard are the main oilseed crops adopted for cultivation both in tropical and sub-tropical countries. In India, these rank second both in average and production next to groundnut. Out of 8 states viz. Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujrat, Karnataka, Maharashtra, Uttar Pradesh and Tamilnadu, which account for nearly 90 per cent of oilseed area and production in the country. Rapeseed and mustard happen to be the major oilseed crops in seven states as against groundnut in four states and soyabean, sesame and niger in one state each. The annual production of rapeseed and mustard rose successively from 4.8 million tonnes in 1992-93 to 6.94 million tonnes in 1996-97 followed by its substantial decrease to 4.94 in 94-98.

Unfortunately, these years the average production in India has not increased substantially and the increase in the total production has principally been owing to the improvements in oilseed production technology, the expansion in cultivated area, the price support policy and
the institutional support, particularly the formation of the "Technology Mission on Oilseeds" in 1986 among others. The average production of rapeseed mustard in India is still far below (1,013 kg/ha) (Hedge and Kiresur, 1999) than the world average (1,262 kg/ha) (Chopra, 1991, Upadhyay and Agarwal 1993). Among various constraints attributed to the low yields, menace due to the insect pests has been the major factor causing deterioration both in quality and quantity.

Mustard crop is destroyed by more than 24 insect species at its various stages of crop growth. The most serious among these is the mustard aphid, *Lipaphis erysimi* Kalt., which alone may cause yield loss of 66.00 to 99.00 per cent in *Brassica campestris* Linn. and 27.00 to 68.00 per cent in *B. juncea* Linn. (Bakhetia, 1989). At every increase in unit aphid per plant, a reduction of 0.063 to 0.064 gm seed weight per plant and 0.036 to 0.039 percent reductions in oil content, has been reported by Singh and Sachan, 1995.

There are more than 24 insect-pest which damage the mustard crop at its various stages of crop growth. Among the various insect -pests associated with mustard crop, mustard aphid, *Lipaphis erysimi* (Hemiptera: Homoptera: Aphididae) is polyphagous pest and causes severe damage to most of the crop of economic importance of different families. These pests of rapeseed and mustard cultivated during being the rabi season from October to March besides it has been also reported to serious on vegetables like cabbage, cauliflower, turnip, radish, broccoli and pulses,
bean, spinach, cucumber, jute, sweet potato and many other important crops (Bakheta and Sindhu, 1970;).

The insect possesses serious threat to the successful cultivation of this very important oil-seed crop. Its infestation on the mustard plant starts with the flower initiation and continuous up to the physiological maturity of the crop. Both the nymph and adults suck the sap from leaves, flowers, pods and tender shoots. (Omkar and Barish 2004). It is mostly confined to apical portion of the plants. This insect has parthenogenetic mode of reproduction so it attains very high population in a very short period under favourable weather conditions. Severely infested plants whiter and die, and unprotected crop fail to produce any seed.

Resistant cultivars are one of the critical components determining the success of the IPM. The mustard aphid, *L. erysimi* Katenbach is a serious pest of cruciferous crops. The estimated yield losses in rapeseed mustard due to aphid alone varied 35.4 – 96.0 percent (Rohilla et al. 1997). The availability of resistant source has been greatly emphasized all over the world as one of the most appropriate tool for IPM as it is easy to adopt, economical and safer than chemical pesticides. The present studies were, therefore, undertaken to investigate the relative performance of large number of genotypes from *Brassica* and allied species to the *L. erysimi* Kalt.

Coccinellids are the most successful and widely used biological controlling agent for the control of the member of aphididae. (Bombawale et al. 2004). Naturally occurring biological controlling agents like
parasites and predators are important factors in regulating population densities. Syrphid fly maggots and ladybird beetles are efficient predators of aphids. (Zaz and Kushwaha 1983, Thomas and Phadke 1995 and Rao et al. 2002) Syrphid maggots are the more common of the two types of predators. Lacewing larvae are often found among aphid colonies. These larvae are called aphid lions. They are less efficient predators than syrphid maggots and ladybird beetles.

A number of scientists have reported the economic threshold level of mustard aphid, *Lipaphis erysimi* Kalt. from different parts of the country, as Bakhetia, 1964 from Punjab, Pant 1998 from West Bengal and Singh and Malik 1998 from Uttar Pradesh, but this factor needs more intensive efforts. Therefore, economic threshold and economic level account along with the extent of this pest and important commercial cultivars of *Brassica juncea* was determine the state, to make need base application insecticide on this crop. Singh and Sachan (1995) reported that at every increase in unit cabbage aphid, *Lipaphis erysimy* Kalt. per-plant, reduction of 0.063 to 0.064 gm seed weight per-plant and 0.036 to 0.39 per cent reduction in oil contain. The estimated yield losses in rapeseed-mustard due to cabbage aphid, *Lipaphis erysimi* Kalt. alone, varied from 30.54 to 96.0 per cent (Rohilla et al., 1997).

Some of the factors that run this pest as most disastrous to mustard crop include its most favoured period being coincided with the onset of floral shoot formation, preference of aphids to newly formed soft and luxuriant growing plant parts, prolific parthenogenetic fecundity,
continuous desapping habit and quick recovery in post treatment population necessitating repeated application of effective chemicals. Toxic insecticides have been of choice chemicals against this pest to ensure instant population kill for assured crop protection. Repeated application of these synthetic insecticides do not prove effective in yield increase since this hampers the degree of seed formation and hence the yield by killing useful pollinators, which are known to play a very vital role in plant fertilization, particularly in mustard crop. These also adversely affect the faunastic balance of natural enemies of aphid like, coccinellids, chrysolids, spiders, ants etc., which could have otherwise exhibited great potential in keeping the aphid population at lower level.


Agriculture in a tropical country like India, owing to its climatic conditions and its particular environment, suffers severe losses due to pests. The Indian farmers need of effective tools to fight against pest after severe
set back arising from the use of chemical pesticides on leaving system and the environment, the use of eco-friendly botanical pesticides is gaining momentum.

However, The small farmers in India are not yet fully aware of the concept, use or advantages of eco-friendly pest management. With the advent of modern synthetic insecticides, it has been customary to underestimate the biological efficacy of botanical products having certain obvious limitations. The reluctance on the part of an investigator in applied toxicology undertake intensive research on the bioactivity of botanical products in the phase of growing demand for more and more potent insecticides has resulted in the paucity of the available data. This attitude coupled with lack of incentive and commercial exploitation of some of the well-known botanical insecticides has created a bottleneck in their mass applicability.

Though India has rich source of plant that could be harnessed as botanical pesticides, accentuated research on the preparation of biopesticides has not gained ground. Botanical pesticides are good alternatives to chemical pesticides. Botanical pesticides are eco-friendly, economic target-specific and biodegradable. For example neem based botanical pesticides have been used traditionally for many years. Over six thousand plant species have been screened for their insecticidal properties. Among them more than seven hundred plant species exhibit measurable quantity of insecticidal activities. (Schreiber 1915, Roark 1947, Rezink and Imbs 1965, Crosby 1966, Butterworth and Morgan 1968, Wada and

Recently, global chemical companies have been spinning off their chemical business and are focusing on the business of plant products and plant-based insecticides. In order to provide better food, better nutrition and better health for all people. Plant origin insecticides offer several opportunities to develop break through products, which might be extremely useful in sustainable agriculture.

Now, that the exportable surplus and byproducts need technological back stopping including even the exclusive use of non-toxic, eco-friendly compounds in aphid control.

Insecticides of botanical origin like nicotine sulphate, had earlier been a chemical of choice to control mustard aphid. Now, it is out of list due to high mammalian toxicity of nicotine and the recent Govt. policy of restriction on tobacco cultivation in India. The other plants, which have

Many conventional synthetic insecticides have, also supplemented neem preparations, like endosulfan to optimize aphid kill. Neem oil mixed with clove oil has in recent years been documented to cause very high toxicity in this aphid spread. Still much has to be done to make better use of this plant and then perhaps all the pests could be controlled by neem preparations with same degree of efficacy and number of applications as with insecticides (Wendt, 1990).
Some of auxins like IAA and NAA have been reported to adversely affect the aphid growth and development under laboratory conditions. These treatments have not yet been tried at field scale. In recent years, the Verticel, a fungal preparation of *Verticillum lecani* has been reported to be a successful biological control agent against a variety of sucking insects, like aphids, jassids, thrips, whiteflies and even some difficult insects like mealy bugs and different types of mites. Use of Vertical has been reported to be useful in crops like cotton, vegetables, oil seeds, pulses, tobacco, grapes, pomegranate, apple and plantation crops like, tea, coffee, coconut, arecanut as well as home gardens (Rup and Dhillon 1999 and Viji and Bhagat 2001). As such, biological control should be preference choice for insects endowed with fast breeding potential like mustard aphid. Selection of certain plant species which are not even touched by the target insects to feed are collected and utilized for *Lipaphis erysimi* Kalt. management. These plants products are less deleterious to human being in manufacturing, handling and in application and very effective against insect pests.

In view of these facts, the present investigation was aimed, therefore, to study on the following lines:

- Survey, selection, extraction and formulation of certain plant materials, which are used for the management of *Lipaphis erysimi* Kalt.
- Seasonal population of *Lipaphis erysimi* Kalt on commonly used cultivars.


* Use of predator in mustard aphid, *Lipaphis erysimi* Kalt. population management.