5.1. MEDICINAL IMPORTANCE OF THE RECORDED HOST PLANTS

1. *Achillea millefolium*
   It is used in the treatment of a very wide range of disorders; anti inflammatory, antiseptic, antispasmodic, aromatic, astringent, carminative, cholagogue, diaphoretic, digestive, emmenagogue, odontalgic, stimulant, tonic, vasodilator and vulnerary.

2. *Aconitum heterophyllum*
   The dried root is analgesic, anti-inflammatory, anti periodic, aphrodisiac, astringent, cholagogue, febrifuge and tonic. In India, used in the treatment of dyspepsia, diarrhoea and coughs. In Tibetan medicine, it is used to treat poisoning from scorpion or snake bites, the fevers of contagious diseases and inflammation of the intestines. Root extract used as substitute of quinine.

3. *Aesculus indica*
   Used as acrid, anti helminthic, anti rheumatic, astringent, narcotic, stomachic. The seeds are astringent, acrid and narcotic. Seed oil is applied externally in the treatment of skin diseases and rheumatism. Juice of the bark is used to treat rheumatism also used as an anti helminthic in horses. Fruits are cathartics.

4. *Alcea rosae*
   Used as anti inflammatory, astringent, demulcent, diuretic, emollient, and febrifuge. Flowers are useful in the treatment of chest complaints. Decoction is used to improve blood circulation, for the treatment of constipation, dysmenorrhoea, haemorrhage, etc. Root is astringent and demulcent. In Tibetan medicine, used in the treatment of inflammations of the kidneys/womb, vaginal/seminal discharge. The roots on their own are used to treat loss of appetite. The seed is demulcent, diuretic and febrifuge. A poultice of leaves applied to wasp and bee stings as a remedy, and also on inflammation. An infusion of the plant provided a mouthwash and a soothing treatment for coughs. It is also used for the treatment of gastric ailments or cystitis.

5. *Aquilegia nivalis*
   Various species of the genus are used as antispasmodic, diaphoretic, parasiticide, resolvent and salve. The root is astringent and diuretic. It is chewed
or made into a weak tea for the treatment of diarrhoea and stomach aches. The tea is used in the treatment of uterine bleeding. The boiled plant used as a hair wash. The seed is anodyne and febrifuge. An infusion is used in the treatment of headaches and fevers.

6. *Aractium lappa*

In the Middle Ages European herbalists used it for the treatment of gall and kidney stones, and later for lung complaints, bladder and kidney ailments and gout. North Americans used the seeds of the plant for medicinal purposes. Now a days burdock is used in Chinese and Western herbal medicine as one of the foremost detoxifying herbs and in certain parts of the world is recommended in the treatment of some cancers. Recent research has shown that seed extracts lower blood sugar levels.

7. *Aralia cashemirica*

Aqueous Alcoholic extract of root shows anti-hyperglycemic activity. The plant is reported to contain Octadec-6-enoic acid, 8- primara-14, 15-diene-19-oic acid, Aralosides A&B Nonane, a hexacosane derivative, petroselinic acid, stigmasterol and sitosterol. Very recently two disaccharides, Glucopyranosyl –O (1®2) fructofuranoside (sucrose) {1} and Glucopyranosyl-O-(1®4)glucopyranoside (Maltose) {2} have been isolated from its roots. Plant also possesses antibacterial properties. *Aralia nudicaulis*, distributed in North America, mainly in Canada, shows anti cancer activity.

8. *Arnebia benthamii*

Shoot extract is cardiac and febrifuge. The plant is considered to be useful in the treatment of diseases of the tongue and throat.

9. *Artemisia absinthium*

European herbalists used it in the treatment of nervous diseases, jaundice, colds, rheumatism, bruises, sprains, loss of appetite, as a heart stimulant and a pain reliever during childbirth. The leaves and flowering shoots are anti helminthic, anti inflammatory, antiseptic, antispasmodic, antitumor, carminative, cholagogue, emmenagogue, febrifuge, hypnotic, stimulant, stomachic, tonic and
vermifuge. Leaves of the plant have been used with some success in the treatment of anorexia nervosa. A warm compress is used to ease sprains and strained muscles.

10. *Asparagus filicinus*

Seed paste used in rheumatism. The dried root is antipyretic, anti tussive, diuretic, expectorant, stomachic, nervous stimulant and tonic.

11. *Atropa acuminata*

Useful for reducing certain glandular secretions. In the form of a liniment it can be recommended for gout or rheumatic inflammation. Used commercially in proprietary plasters and medicines (including travel sickness pills) and also in ophthalmological preparations. The roots and leaves are used in India as anodyne, diuretic, narcotic sedative and mydriatic. It has the effect of dilating the pupils thus making it easier to perform eye operations. The plant can be used to treat the symptoms of Parkinson’s disease, reducing tremors and rigidity whilst improving speech and mobility.

12. *Berberis lycium*

The roots are aperient, carminative, febrifuge and ophthalmic. They are used in the treatment of eye complaints, menorrhagia, chronic diarrhoea and piles. The leaves have been used in the treatment of jaundice. Alkaloid Berberine, universally present in rhizomes of *Berberis* species, has marked antibacterial effects and also shows anti tumor activity.

13. *Bergenia ciliata*

In Nepal juice or powder of the whole plant is used to treat urinary troubles and as drops to relieve earaches. The root is used as a tonic, in the treatment of fevers, diarrhoea, coughs, colds, hemorrhoids, asthma and urinary problems. Externally, the root is bruised and applied as a poultice to boils and ophthalmia. Root of the plant has a high reputation in indigenous systems of medicine for dissolving stones in the kidneys.
14. *Cannabis sativa*

The whole plant is anodyne, anti helminthic, antiemetic, anti inflammatory, anti periodic, antispasmodic, cholagogue, diuretic, emollient, hypnotic, hypotensive, laxative, narcotic, ophthalmic and sedative. It is used to relieve some of the unpleasant side effects suffered by people undergoing chemotherapy for cancer, particularly it is very effective in removing the feelings of nausea and indeed helps to create an appetite and positive attitude of mind. Used in the treatment of glaucoma and relieves the distressing constant desire to urinate that is suffered by many people with multiple sclerosis. Given to patients suffering from AIDS, it helps them to put on weight. Since it strongly increases the desire for food it has been found of benefit in treating anorexia nervosa. It is used externally as a poultice for corns, sores, varicose veins, gout and rheumatism. It is useful in neuralgia, gout, rheumatism, delirium tremens, insanity, infantile convulsions, insomnia, gonorrhea, menorrhagia, chronic cystitis and urinary affections.

15. *Celosia argentea*

The flowers and seeds are astringent, haemostatic, ophthalmic, parasiticide and poultice used in the treatment of bloody stool, hemorrhoid bleeding, uterine bleeding, leucorrhoea and diarrhoea. As a parasiticide it is very effective against *Trichomonas*, a 20% extract can cause the *Trichomonas* to disappear in 15 minutes. The seed is hypotensive and ophthalmic. It is used in the treatment of bloodshot eyes, blurring of vision, cataracts and hypertension, it also has an antibacterial action, inhibiting the growth of *Pseudomonas*.

16. *Celtis australis*

Leaves and fruits are astringent, lenitive and stomachic. Decoction of leaves and fruits is used in the treatment of amenorrhea, heavy menstrual and inter menstrual bleeding and colic. The decoction is also used to astringe the mucous membranes in the treatment of diarrhoea, dysentery and peptic ulcers.

17. *Centurea iberica*

Flower heads curative in eczema. Used as a wild vegetable by the people in Kashmir valley. Recently isolated new compounds from the plant show
significant inhibition of platelet aggregation. Earlier other medicinal properties of the plant have been reported, including anti-inflammatory, wound healing and insulin secretion activities of the plant extract.

18. *Chenopodium album*

The leaves are anthelmintic, antiphlogistic, antirheumatic, mildly laxative, odontalgic. The leaves are applied as a wash or poultice to bug bites, sunstroke, rheumatic joints and swollen feet, whilst a decoction is used for carious teeth. The seeds are chewed in the treatment of urinary problems and are considered useful for relieving the discharge of semen through the urine. The juice of the stems is applied to freckles and sunburn. The juice of the root is used in the treatment of bloody dysentery.

19. *Cichorium intybus*

Cultivated variety is useful in thirst, ophthalmia, throat inflammation, enlargement of spleen, fever, vomiting and diarrhea. Wild bitter variety is astringent to bowels, cures asthma, biliousness and enriches the blood.

20. *Coriandrum sativum*

Leaves are analgesic, useful in hiccoughs, suppuration, piles, pain in eyes, gleet, jaundice, stomatitis, tooth ache, bleeding gums, scabies, diuretic, stomachic, cures bronchitis and biliousness. In Chinese medicine today it is still used in remedies to combat dysentery and measles, and in eastern India coriander seed is an ingredient in eyewash that is used to prevent blindness from smallpox.

21. *Crocus sativus*

Dried stigmas are stimulant, stomachic, aphrodisiac, anodyne, antispasmodic, emmenagouge, diuretic, galactogouge, useful in bronchitis, pharyngopathy, cepalagia, melancholia, hepatomegaly, nephropathy, splenopathy and skin diseases.

22. *Cynara cardunculus*

In biological assays, *C. cardunculus* extracts show antimicrobial activity comparable with standard antibiotics. Cynarin, an active chemical constituent in the plant causes an increased bile flow, aids in digestion, strengthening of the liver function, gall bladder function and raising of HDL/LDL ratio. This reduces
cholesterol levels, which diminishes the risk for arteriosclerosis and coronary heart disease. Aqueous extracts of leaves are known to reduce cholesterol by inhibiting HMG-CoA reductase and having a hypolipidemic influence, lowering blood cholesterol. Plant also contains bioactive agents, apigenin and luteolin. Leaf extract has proved helpful for patients with functional dyspepsia and may ameliorate symptoms of IBS.

23. *Daucus carota*

The whole plant is anithelmintic, carminative, deobstruent, diuretic, galactogogue, ophthalmic, stimulant. An infusion is used in the treatment of various complaints including digestive disorders, kidney and bladder diseases, in the treatment of dropsy, counter cystitis and kidney stone formation, and to diminish stones that have already formed. Significant amounts of porphyrins cause release of increased levels of sex hormones. The plant is harvested in July and dried for later use. A warm water infusion of the flowers has been used in the treatment of diabetes. The root is also used to encourage delayed menstruation. Seeds can be abortifacient and so should not be used by pregnant women.

24. *Datura stramonium*

The leaves, flowering tops and seeds are anodyne, anti asthmatic, anti spasmodic, hallucinogenic, hypnotic, mydriatic and narcotic. The seeds are the most active medicinally. The plant is used internally in the treatment of asthma and Parkinson's disease. Externally, it is used as a poultice or wash in the treatment of fistulas, abscesses, wounds and severe neuralgia. There are also traces of scopolamine, a potent cholinergic-blocking hallucinogen, which has been used to calm schizoid patients. It was reported in 2002 that Japanese scientists have identified chemicals that can be used to stem growth in some kinds of brain cancer.

25. *Dipsacus inermis*

Leaf decoction is used by local women for bathing after delivery. It is also used as a wild vegetable.
26. *Ficus carica*

A decoction of the leaves is stomachic. The leaves are also added to boiling water and used as a steam bath for painful or swollen piles. The latex from the stems is used to treat corns, warts and piles. The plant has anticancer properties as well.

27. *Foeniculum vulgare*

Commonly used in household remedy, being useful in the treatment of a variety of complaints, especially those of the digestive system. The seeds, leaves and roots can be used, but the seeds are most active medicinally. It can also be used as a gargle for sore throats and as eyewash for sore eyes and conjunctivitis. Fennel is often added to purgatives in order to allay their tendency to cause gripe, and also to improve the flavor. In China still today fennel is used to treat snake bites, mushroom poisoning and scorpion bites. Oil extract is fairly good wormicide against hook worms.

28. *Heracleum candicans*

Xanthotoxin extracted from roots is widely used in the treatment of leucoderma, as a component of sun-tan lotion and in treating skin diseases (eczema itches, etc.), stomach disorders (liver complaints), arthritis and toothache. Fruits are used as aphrodisiac and nerve tonic, and for intestinal parasites. Other uses are for phlegm and wind disorders, ear ache, bleeding, leprosy, fever due to wounds, and blood pressure.

29. *Hyoscyamus niger*

All parts of the plant, but especially the leaves and the seeds are anodyne, antispasmodic, mildly diuretic, hallucinogenic, hypnotic, mydriatic, narcotic and sedative. The plant is used internally in the treatment of asthma, whooping cough, motion sickness, Meniere's syndrome, tremor in senility or paralysis and as a pre-operative medication. Its sedative and antispasmodic effect makes it a valuable treatment for the symptoms of Parkinson's disease, relieving tremor and rigidity during the early stages of the disease. It is retained today in the pharmacopoeias of some European and South American countries for use in the
treatment of certain specific spasms. It was used as an anesthetic in Arab hospitals during early times.

30. Hypericum perforatum
The plant contains many biologically active compounds including rutin, pectin, choline, sitosterol, hypericin and pseudo hypericin. These last two compounds have been shown to have potent anti-retroviral activity without serious side effects and they are being researched in the treatment of AIDS. It is used in the treatment of injuries, bites, stings, etc and is said to be the first remedy to consider when nerve-rich areas such as the spine, eyes, fingers etc are injured. In the Middle Ages it was often used to treat deep sword cuts and more recent research in Germany has confirmed its anti-bacterial qualities. It is also valued in the treatment of sunburn and as a cosmetic preparation to the skin.

31. Impatiens balsamina
The plant is cathartic, diuretic and emetic. It is used in the treatment of pains in the joints. The leaf juice is used as a treatment against warts. The flowers are cooling, mucilaginous and tonic. They are useful when applied to burns and scalds. The juice of the flowers is used to treat snakebites. The flowers and their alcoholic extract possess marked antibiotic activity against some pathogenic fungi and bacteria. The seed is expectorant and has been used in the treatment of cancer. The powdered seeds are given to women during labor in order to provide strength.

32. Impatiens glandulifera
The plant is used in Bach flower remedies for impatience, irritability and extreme mental tension. It is also one of the five ingredients in the 'Rescue remedy.'

33. Inula racemosa
The rhizome is used in the treatment of contagious fevers that have not fully ripened and pain in the upper body, especially between the neck and the shoulders. Roots are expectorant and seeds are aphrodisiac.

34. Lavatera kashmeriana
Leaves are demulcent, pectoral and purgative. Seeds are antiseptic.

35. *Lavendula angustifolia*

The oil is known to possess sedative, carminative, anti-depressive and anti-inflammatory properties. Oil is active against methicillin-resistant *Staphylococcus*. Antifungal activity of the oil against *Aspergillus nidulans* and *Trichophyton mentagrophytes* has been worked out. Lavender has had the reputation for being an aphrodisiac. Distilled flower water is recommended by herbalists as vocal restorative, a cleaning agent, a remedy for syncope, loss of appetite, tooth ache, neuralgia, sprains and rheumatism. Recently a potential anticancer agent, Perillyl alcohol (POH) has been identified in the oil.

36. *Lychnis coronaria*

Medicinally, in India an extract of root has been used in treating lung ailments and liver disorders.

37. *Malva neglecta*

Medicinally, the leaves have been used in India to treat piles. The seeds have been employed locally in internal remedies for bronchitis, coughs and piles and applied externally for skin disorders. The plant is an excellent laxative for young children.

38. *Melissa officinalis*

It acts to inhibit thyroid activity. An infusion of the leaves is used in the treatment of fevers and colds, indigestion associated with nervous tension, excitability and digestive upsets in children, hyperthyroidism, depression, mild insomnia, headaches etc. Externally, it is used to treat herpes, sores, gout, insect bites. The essential oil contains citral and citronella, which act to calm the central nervous system and treat various psychiatric disorders. The plant also contains polyphenols, in particular these combat the herpes simplex virus which produces cold sores. Also used in the treatment of mumps and eczema.

39. *Mentha longifolia*

The leaves and flowering stems are anti asthmatic, antispasmodic, carminative and stimulant, large doses can cause an abortion. A tea made from the leaves has
traditionally been used in the treatment of fevers, headaches, digestive disorders and various minor ailments. The essential oil in the leaves is antiseptic, though toxic in large doses.

40. *Mentha piperita*
Leaf infusion used in indigestion and rheumatic pain.

41. *Myosotis arvensis*
Decoction of the herb *M. imitata* is used internally in Yakutia folk medicine for tuberculosis. *M. arvensis* is used for the same purposes in western European countries. It is an important ingredient of medicinal product ‘Lyphosot’ in Europe, used to support lymphatic system in conditions such as tonsillitis, enlarged lymph glands, and light water retention, by increasing the amount of urination.

42. *Nepeta cataria*
An infusion produces free perspiration, beneficial in the treatment of fevers and colds. It is also very useful in the treatment of restlessness and nervousness, being very useful as a mild nervine for children. A tea made from the leaves has also been recommended for nursing childish diseases such as measles and chickenpox. The fresh leaves are chewed to ease toothache.

43. *Nymphaea alba*
Leaves and flowers are anti periodic.

44. *Ocimum basilicum*
The leaves and flowering tops are antispasmodic, aromatic, carminative, digestive, galactogogue, stomachic and tonic. Extracts from the plant are bactericidal and are also effective against internal parasites. It is interesting that 1 oz. of fresh basil leaves provides 24% of a man’s and 30% of a woman’s daily requirement of Vitamin A (equivalent to 1¾ oz. carrots) and 11% of an adult’s daily requirement of calcium. Another quality is highlighted in relatively recent clinical trials in India where it has been shown that basil can help in the
treatment of acne. In India the seeds also are used as a remedy for dysentery and chronic diarrhoea.

45. *Oenothera glazioviana*

The oil in the seeds is anti-cholesterolemic, astringent, hypotensive, sedative and reduces cholesterol levels. Research suggests that the oil is potentially very valuable in the treatment of multiple sclerosis, pre-menstrual tension, hyperactivity, etc.

46. *Origanum normale*

Leaf powder used to cure wounds.

47. *Papaver somniferum*

It is used as an anodyne, antispasmodic, antitussive, astringent, diaphoretic, emmenagogue and sedative. It is also used in the treatment of constipation, fevers and insomnia.

48. *Peganum harmala*

The seeds are used as an anti-helminthic against tapeworms. The seeds contain the substance 'harmine' which is being used in research in mental diseases, encephalitis and inflammation of the brain. The whole plant is said to be abortifacient, aphrodisiac, emmenagogue and galactagogue. A decoction of the leaves is used in the treatment of rheumatism.

49. *Picrorhiza kurrooa*

The dried rhizome is antibacterial, anti-inflammatory, anti-periodic, cathartic, cholagogue, laxative, stomachic and bitter tonic. The root contains a number of very bitter glucosides including kutkin and picrorhizin. It also contains apocynin, which is powerfully anti-inflammatory and reduces platelet aggregation. In trials, the rhizome was shown to boost the immune system and to have a specific action against the parasite *Leishmania donovani*, which causes the tropical parasitic disease called leishmaniasis. The rhizome has a very beneficial effect upon the liver and digestive system and is used in the treatment of a wide range of conditions including fevers, constipation, dyspepsia and jaundice. There is also some evidence that the rhizome can be of help in the
treatment of bronchial asthma and a number of auto immune diseases such as psoriasis and vitiligo, whilst it has also been shown to reduce blood cholesterol levels and reduce coagulation time.

50. *Plantago major*
Leaves are safe and effective treatment for bleeding; it quickly staunches blood flow and encourages the repair of damaged tissues. The leaves are astringent, demulcent, deobstruent, depurative, diuretic, expectorant, haemostatic and refrigerant. Root is a remedy for the bite of rattle snakes. Seeds contain up to 30% mucilage which swells up in the gut, acting as a bulk laxative and soothing irritated membranes. Sometimes the seed husks are used without the seeds. Distilled water solution made from the plant makes an excellent eye lotion. Herbalists used also to recommend the juice for various complaints including syphilis.

51. *Podophyllum hexadrarrum*
The whole plant, but especially the root, is cholagogue, cytostatic and purgative. The plant contains podophyllin, which has an anti mitotic effect. It is, therefore, a possible treatment for cancer, and has been used especially in the treatment of ovarian cancer. This species contains about twice the quantity of active ingredient than *P. peltatum.* The roots contain several important anti-cancer lignins, including podophyllin and berberine. The roots are also anti rheumatic.

52. *Polygonum amplexicaule*
A famous traditional herb used to treat fractures, rheumatoid arthritis, muscle injury and pain. This year only a compound, emodin-8-β-D-glucoside (EG), was isolated from the plant by Chinese workers. The compound, EG, directly stimulates cell proliferation and differentiation of osteoblasts, promoting the healing of bone rheumatism and various fractures.

53. *Primula denticulata*
In folk medicine powdered dried flowers are applied to eyes for the control of eye diseases like ophthalmia and also for the improvement of eyesight.

54. *Prunella vulgaris*

Most useful constituents of the plant are betulinic acid, D-camphor, delphinidin, hyperoside, manganese, oleanolic acid, rosmarinic acid, rutin, ursolic acid, and tannins. Clinical analysis shows it to have an antibacterial action, inhibiting the growth of pseudomonas, *Bacillus typhi*, *E. coli*, *Mycobacterium tuberculi*, which supports its use as an alternative medicine internally and externally and as an antibiotic for hard to heal wounds and diseases. It is showing promise in research for cancer, AIDS, diabetes, and many other maladies.

55. *Punica granatum*

All parts of the plant contain unusual alkaloids, known as 'pelletierines', which paralyze tapeworms so that they are easily expelled from the body by using a laxative. The plant is also rich in tannin, which makes it an effective astringent. It is used externally in the treatment of vaginal discharges, mouth sores and throat infections. The whole plant, but in particular the bark, is antibacterial, antiviral and astrigent. It is also cardiac and stomachic. The dried pericarp is decocted with other herbs and used in the treatment of colic, dysentery, leucorrhoea, etc.

56. *Rheum emodi*

It is one of the most widely used herbs in Chinese medicine. The root is anticholesterolemic, antiseptic, antispasmodic, antitumor and aperient. The root is taken internally in the treatment of chronic constipation, diarrhoea, liver, gall bladder complaints, hemorrhoids, menstrual problems and skin eruptions due to accumulation of toxins. Externally, the root is used in the treatment of burns. A homeopathic remedy prepared from the dried root is used especially in the treatment of diarrhoea in teething children.

57. *Rhus succedanea*

Used as an antidote, antivinous, cholagogue, febrifuge and ophthalmic. As a wash to counteract varnish poisoning. The fruit is used in the treatment of
phthisis. Wax from the fruits is used in ointments. An ethanolic extract of the leaves exhibits anticancer and antiviral activities.

58. *Rosa webbiana*

Besides other bioactive compounds, fruits of the plant are rich in vitamins A, C and E. Flavanoids and minerals are also abundant in fruits of the plant. Nowadays the plant is being explored for halting and reversing cancerous growths.

59. *Rumex hastatus*

The juice of the plant is astringent and is used in the treatment of bloody dysentery. The fresh tuber is chewed to relieve aches in the throat. Roots and leaves are purgative.

60. *Salix alba*

Bark is a natural source of salicylic acid on which aspirin is based. It contains salicin, which probably decomposes into salicylic acid (closely related to aspirin) in the human body. It is used internally in the treatment of dyspepsia connected with debility of the digestive organs, rheumatism, arthritis, gout, inflammatory stages of auto-immune diseases, feverish illnesses, neuralgia and headache. Its tonic and astringent properties render it useful in convalescence from acute diseases. An infusion of the leaves has a calming effect and is helpful in the treatment of nervous insomnia.

61. *Salvia sclarea*

Regarded as a calming herb that helps relieves period pain and pre menstrual problems and is a valuable remedy for complaints associated with the menopause particularly hot flushing. Owing to its estrogen stimulating action, it is most effective when levels of this hormone are low. The whole plants, and especially the leaves, are anti spasmodic, appetizer, aromatic, astringent, balsamic, carminative, pectoral and tonic. It is useful in treating disorders of the stomach and kidneys. The seed forms thick mucilage when it is soaked for a few minutes in water. This is efficacious in removing small particles of dust from the eyes.
62. *Sambucus wightiana*

The herb is commonly used in the treatment of liver and kidney complaints. When bruised and laid on boils and scalds, they have a healing effect. They can be made into a poultice for treating swellings and contusions. The root is diaphoretic, mildly diuretic and a drastic purgative. Fruits of the plant are used to initiate stomach disorders and to wash stomach to expel poisonous substances.

63. *Sassurea costus*

Roots are used as aphrodisiac, cardiac stimulant, carminative, expectorant and as diuretic. It remarkably controls attacks of bronchial asthma, especially those of the vagotonic type. The paroxysms are cut short by the combined effect of the essential oil and the alkaloid present in the root. It is also useful in persistent whooping cough.

64. *Solanum nigrum*

Recommended by herbalists as a remedy for treating earache, ringworm and gout, and as an ingredient in an ointment for soothing inflamed eyes. The leaves, stems and roots are used externally as a poultice, wash, etc in the treatment of sores, boils, leucoderma and wounds. Extracts of the plant are analgesic, antispasmodic, anti-inflammatory and vasodilator.

65. *Trigonella foenum-graceum*

The seeds are very nourishing and are given to convalescents and to encourage weight gain, especially in anorexia nervosa. Research has shown that the seeds can inhibit cancer of the liver, lower blood cholesterol levels and also have an anti diabetic effect. The seed is very nourishing and body-building and is one of the most efficacious tonics in cases of physical debility caused by anaemia or by infectious diseases, especially where a nervous factor is involved. It is also used as a douche for excessive vaginal discharge. Compounds extracted from the plant have shown cardio tonic, hypoglycaemic, diuretic, anti phlogistic and hypotensive activity. One of its constituent alkaloids, called 'trigonelline', has shown potential for use in cancer therapy. The seed contains the saponin
diosgenin, an important substance in the synthesis of oral contraceptives and sex hormones.

66. *Urtica dioica*

Externally, the plant is used to treat skin complaints, arthritic pain, gout, sciatica, neuralgia, hemorrhoids and hair problems. The root has been shown to have a beneficial effect upon enlarged prostate glands. A homeopathic remedy is made from the leaves. In India a decoction of the plant has been employed to treat kidney disorders, tuberculosis and jaundice. The plant is a rich source of beta-carotene and Vitamin A and is therefore believed to assist in reducing the risk of contracting some forms of cancer.

67. *Verbascum thapsus*

It acts by reducing the formation of mucus and stimulating the coughing up of phlegm, and is a specific treatment for tracheitis and bronchitis. Infusion of the flowers in olive oil is used as earache drops, or as a local application in the treatment of piles and other mucous membrane inflammations. A decoction of the seeds is used to soothe chilblains and chapped skin.

68. *Lupinus polyphyllus*

A decoction of the plant has been used as a tonic. The plant was a source of medicine for a few North American Indian tribes, including the Thompson Indians who used lupine to treat their horses.
### 5.2. INSECT- HOST PLANT CATALOGUES

#### 5.2.1. Order Lepidoptera

**Table: 1**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Insect Species</th>
<th>Insect Family</th>
<th>Host Plants</th>
<th>Incidence</th>
<th>Damage</th>
<th>Activity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><em>Heliothis peltigera</em></td>
<td>Noctuidae</td>
<td>*H. niger, <em>I. racemosa</em></td>
<td>10-25%</td>
<td>10-30%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>3</td>
<td><em>Pyrrhia umbra</em></td>
<td>Noctuidea</td>
<td><em>R. scuccedanea</em></td>
<td>7-10%</td>
<td>3-4%</td>
<td>Aug-Sept</td>
</tr>
<tr>
<td>6</td>
<td><em>Spodoptera exigua</em></td>
<td>Noctuidae</td>
<td>*P. harmala, P. major</td>
<td>8-80%</td>
<td>10-30%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>7</td>
<td><em>Mamestra brassicae</em></td>
<td>Noctuidae</td>
<td>*R. emodi, <em>A. acuminata</em></td>
<td>15-20%</td>
<td>20-25%</td>
<td>May-Oct</td>
</tr>
<tr>
<td>8</td>
<td><em>Agrotis ipsilon</em></td>
<td>Noctuidae</td>
<td><em>P. kurroa</em></td>
<td>20-25%</td>
<td>95-100%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>9</td>
<td><em>Xestia c- nigrum</em></td>
<td>Noctuidae</td>
<td><em>A. acuminata</em></td>
<td>5-7%</td>
<td>15-20%</td>
<td>Jul</td>
</tr>
<tr>
<td>10</td>
<td><em>Mythimna sp.</em></td>
<td>Noctuidae</td>
<td><em>R. hastatus, P. denticulata</em></td>
<td>5-7%</td>
<td>10-12%</td>
<td>Jun-Oct</td>
</tr>
<tr>
<td>11</td>
<td><em>Cucilla verbasci</em></td>
<td>Noctuidae</td>
<td><em>V. thapsus</em></td>
<td>7-10%</td>
<td>35-50%</td>
<td>Jun-Sept</td>
</tr>
<tr>
<td>12</td>
<td><em>Ascotis selenaria</em></td>
<td>Geometridae</td>
<td>*A. acuminata, <em>A. cachemirica</em></td>
<td>5-10%</td>
<td>17-40%</td>
<td>Jun</td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Family</td>
<td>Host Plant</td>
<td>Ecto</td>
<td>Endo</td>
<td>Season</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>--------</td>
<td>------------</td>
<td>------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>13</td>
<td>Ascotis imparata</td>
<td>Geometridae</td>
<td>C. sativa, *B. lycium</td>
<td>5-7%</td>
<td>10-12%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>14</td>
<td>Triphosa dubiosta</td>
<td>Geometridae</td>
<td>B. lycium</td>
<td>3-5%</td>
<td>7-10%</td>
<td>Jul</td>
</tr>
<tr>
<td>15</td>
<td>Spilosoma erythrozona</td>
<td>Arctiidae</td>
<td>A. acuminata</td>
<td>7-12%</td>
<td>30-65%</td>
<td>Jul</td>
</tr>
<tr>
<td>16</td>
<td>Spilarctia obliqua</td>
<td>Arctiidae</td>
<td>*R. emodi, *R. hastatus, *U. diocia</td>
<td>3-5%</td>
<td>7-10%</td>
<td>Jun-Aug</td>
</tr>
<tr>
<td>17</td>
<td>Pyrausta sp.</td>
<td>Crambidae</td>
<td>C. album, M. longifolia</td>
<td>5-10%</td>
<td>80-85%</td>
<td>Jul-Sept</td>
</tr>
<tr>
<td>18</td>
<td>*Pleuroptya sabinusalis</td>
<td>Crambidae</td>
<td>U. diocia</td>
<td>15-20%</td>
<td>20-30%</td>
<td>May-Aug</td>
</tr>
<tr>
<td>19</td>
<td>Clepsis ruriana</td>
<td>Totricidae</td>
<td>A. heterophyllum</td>
<td>15-17%</td>
<td>10-50%</td>
<td>Aug</td>
</tr>
<tr>
<td>20</td>
<td>Ulodemis trigrapha</td>
<td>Totricidae</td>
<td>C. sativa</td>
<td>5-7%</td>
<td>10-70%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>21</td>
<td>Euproctis scinitillans</td>
<td>Lymantriidae</td>
<td>C. sativa</td>
<td>3-5%</td>
<td>5-7%</td>
<td>Aug-Oct</td>
</tr>
<tr>
<td>22</td>
<td>Agonopterix pahalgami sp.nov.</td>
<td>Oecophoridae</td>
<td>S. costus</td>
<td>20-25%</td>
<td>10-30%</td>
<td>Aug</td>
</tr>
<tr>
<td>23</td>
<td>*Callidrepana argenteola</td>
<td>Drepanidae</td>
<td>*R. succedanea</td>
<td>60-65%</td>
<td>5-8%</td>
<td>Jul-Sept</td>
</tr>
<tr>
<td>24</td>
<td>*Eteoryctis syngamma</td>
<td>Gracillaridae</td>
<td>*R. succedanea</td>
<td>40-80%</td>
<td>7-35%</td>
<td>Jul-Sept</td>
</tr>
<tr>
<td>25</td>
<td>Phyllonorycter sulaimani sp.nov.</td>
<td>Gracillaridae</td>
<td>C. australis</td>
<td>50-70%</td>
<td>5-6%</td>
<td>Aug</td>
</tr>
<tr>
<td>26</td>
<td>**Chrysoesthia sexgutella</td>
<td>Gelechiidae</td>
<td>C. album</td>
<td>25-30%</td>
<td>9-100%</td>
<td>Jun-Oct</td>
</tr>
<tr>
<td>27</td>
<td>Carcharodus alcea</td>
<td>Hesperidae</td>
<td>A. rosea</td>
<td>10-12%</td>
<td>20-30%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>28</td>
<td>Pieris brassicae</td>
<td>Pieridae</td>
<td>Nepeta sp.</td>
<td>7-15%</td>
<td>10-40%</td>
<td>Jul</td>
</tr>
<tr>
<td>29</td>
<td>Pieris dapladice</td>
<td>Pieridae</td>
<td>*D. Stramonium</td>
<td>5-8%</td>
<td>20-30%</td>
<td>Aug-Sept</td>
</tr>
<tr>
<td>30</td>
<td>Aglais kashmirensis</td>
<td>Nymphalidae</td>
<td>U. diocia</td>
<td>5-15%</td>
<td>15-20%</td>
<td>Jul-Aug</td>
</tr>
<tr>
<td>31</td>
<td>Venessa indica</td>
<td>Nymphalidae</td>
<td>*C. iberica, U. diocia, *C. cardunculus</td>
<td>8-10%</td>
<td>20-30%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>33</td>
<td>Deudorix epijarbas</td>
<td>Lycaenidae</td>
<td>A. indica, P. granatum</td>
<td>17-65%</td>
<td>50-100%</td>
<td>Jul-Sep</td>
</tr>
<tr>
<td>34</td>
<td>Lampides boeticus</td>
<td>Lycaenidae</td>
<td>L. polyphylus</td>
<td>12-15%</td>
<td>15-20%</td>
<td>Jun</td>
</tr>
<tr>
<td>35</td>
<td>Lycaena phalaes</td>
<td>Lycaenidae</td>
<td>R. hastatus, *R. emodi</td>
<td>10-12%</td>
<td>8-12%</td>
<td>Jun-Aug</td>
</tr>
</tbody>
</table>
### 5.2.2. Order Coleoptera

#### Table: 2

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Insect Species</th>
<th>Insect Family</th>
<th>Host Plants</th>
<th>Incidence</th>
<th>Damage%</th>
<th>Activity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Altica</em> sp.</td>
<td>Chrysomelidae</td>
<td><em>R. hastatus, R. emodi, I. balsamina, I. glandulifera</em></td>
<td>30-70%</td>
<td>10-60%</td>
<td>Apr-Oct</td>
</tr>
<tr>
<td>2</td>
<td><em>Chrysolina coerulls bella</em></td>
<td>Chrysomelidae</td>
<td><em>M. piperita, M. longifolia, M. officinalis, S. sclarea.</em></td>
<td>20-75%</td>
<td>5-80%</td>
<td>Apr-Aug</td>
</tr>
<tr>
<td>3</td>
<td><em>Psyloides brettinghami</em></td>
<td>Chrysomelidae</td>
<td><em>A. acuminata, S. nigrum</em></td>
<td>12-75%</td>
<td>8-25%</td>
<td>Jun-Oct</td>
</tr>
<tr>
<td>4</td>
<td><em>Aphona nigrilabrus</em></td>
<td>Chrysomelidae</td>
<td><em>V. thapsus</em></td>
<td>8-70%</td>
<td>3-15%</td>
<td>Mar-Sep</td>
</tr>
<tr>
<td>5</td>
<td><em>Crioceris asparagi</em></td>
<td>Chrysomelidae</td>
<td><em>B. lycium, A. rosea, A. nivalis, C. cardunculus</em></td>
<td>7-25%</td>
<td>5-10%</td>
<td>Apr-Oct</td>
</tr>
<tr>
<td>6</td>
<td><em>Protaetia neglecta</em></td>
<td>Scarabaeidae</td>
<td><em>P. kurroa</em></td>
<td>5-25%</td>
<td>10-12%</td>
<td>Apr-Jul</td>
</tr>
<tr>
<td>7</td>
<td><em>Protaetia impavida</em></td>
<td>Scarabaeidae</td>
<td><em>A. rosea, B. lycium</em></td>
<td>5-25%</td>
<td>10-12%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>8</td>
<td><em>Hopila polita</em></td>
<td>Scarabaeidae</td>
<td><em>S. wightiana</em></td>
<td>15-20%</td>
<td>8-12%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>9</td>
<td><em>Adoretus boops</em></td>
<td>Scarabaeidae</td>
<td><em>P. kurroa</em></td>
<td>18-20%</td>
<td>100%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>10</td>
<td><em>Euparea sp.</em></td>
<td>Nitidulidae</td>
<td><em>A. mellifolium, D. inermis</em></td>
<td>5-35%</td>
<td>......</td>
<td>May-Sep</td>
</tr>
<tr>
<td>11</td>
<td><em>Meligethes sp.</em></td>
<td>Nitidulidae</td>
<td><em>A. acuminata</em></td>
<td>20-70%</td>
<td>......</td>
<td>May-Sep</td>
</tr>
<tr>
<td>12</td>
<td><em>Himalayrhynchites canus</em></td>
<td>Attelabidae</td>
<td><em>B. lycium</em></td>
<td>5-7%</td>
<td>4-6%</td>
<td>Mar-May</td>
</tr>
<tr>
<td>13</td>
<td><em>Anthrenus picturatus</em></td>
<td>Dermestidae</td>
<td><em>H. candidans, R. emodi, D. carotta</em></td>
<td>20-35%</td>
<td>......</td>
<td>May-Jul</td>
</tr>
<tr>
<td>14</td>
<td><em>Anthrenus latefasciatus</em></td>
<td>Dermestidae</td>
<td><em>H. candidans, R. emodi, D. carotta</em></td>
<td>20-35%</td>
<td>......</td>
<td>May-Jun</td>
</tr>
<tr>
<td>15</td>
<td><em>Rhinusa tetrum</em></td>
<td>Curculionidae</td>
<td><em>V. thapsus</em></td>
<td>3-4%</td>
<td>10-12%</td>
<td>Jun-Aug</td>
</tr>
<tr>
<td>16</td>
<td><em>Cionus hortulans</em></td>
<td>Curculionidae</td>
<td><em>V. thapsus, O. glazioviana</em></td>
<td>30-70%</td>
<td>35-40%</td>
<td>Jun-Aug</td>
</tr>
<tr>
<td>17</td>
<td><em>Mylocerus viridianus</em></td>
<td>Curculionidae</td>
<td><em>P. harmala</em></td>
<td>40-70%</td>
<td>10-12%</td>
<td>Jun-Aug</td>
</tr>
<tr>
<td>18</td>
<td><em>Mylocerus sp.</em></td>
<td>Curculionidae</td>
<td><em>A. indica</em></td>
<td>12-15%</td>
<td>7-15%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>19</td>
<td><em>Cytozemia dispar</em></td>
<td>Curculionidae</td>
<td><em>A. rosea</em></td>
<td>5-10%</td>
<td>5-7%</td>
<td>Apr-June</td>
</tr>
<tr>
<td>20</td>
<td><em>Bruchidius tuberculatus</em></td>
<td>Bruchidae</td>
<td><em>C. iberica</em></td>
<td>40-80%</td>
<td>25-35%</td>
<td>Jun-Oct</td>
</tr>
</tbody>
</table>
### 5.2.3. Order Hemiptera

#### Table: 3

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Insect Species</th>
<th>Insect Family</th>
<th>Host Plants</th>
<th>Activity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lygus pratensis</td>
<td>Miridae</td>
<td>*A. millefolium, A. absinthium, *C. argentea, *O. basilicum, *P. harmala</td>
<td>Apr-Aug</td>
</tr>
<tr>
<td>3</td>
<td>Nysius sp.</td>
<td>Coreidae</td>
<td>*B. ciliata, O. normale, A. mellefolium, A. absinthium</td>
<td>Mar-Aug</td>
</tr>
<tr>
<td>4</td>
<td>**Pyrrhocoris apterus</td>
<td>Pyrrhocoridae</td>
<td>A. rosea, L. cachemiriana, M. neglecta</td>
<td>Jul-Oct</td>
</tr>
<tr>
<td>5</td>
<td>**Corizus hyoscamyi</td>
<td>Rhopalidae</td>
<td>T. foenum-graceum, V. thapsus</td>
<td>Jul-Aug</td>
</tr>
<tr>
<td>6</td>
<td>Liorhyssus rubicundus</td>
<td>Rhopalidae</td>
<td>P. harmala, A. absinthium, A. mellefolium, A. rosea, C. argenteola</td>
<td>Apr-Aug</td>
</tr>
<tr>
<td>7</td>
<td>*Dictyta nassata</td>
<td>Tingidae</td>
<td>*A. benthamii, M. arvensis</td>
<td>May-Aug</td>
</tr>
<tr>
<td>9</td>
<td>Krisna sp.</td>
<td>Cicadellidae</td>
<td>B. lycium</td>
<td>Aug</td>
</tr>
<tr>
<td>10</td>
<td>Leptocentrus sp.</td>
<td>Membracidae</td>
<td>A. rosea</td>
<td>May-Jun</td>
</tr>
<tr>
<td>11</td>
<td>Aphis nerri</td>
<td>Aphididae</td>
<td>V. thapsus</td>
<td>May-Aug</td>
</tr>
<tr>
<td>12</td>
<td>Rhopalosiphum nymphaeae</td>
<td>Aphididae</td>
<td>N. alba</td>
<td>Apr-Jul</td>
</tr>
<tr>
<td>13</td>
<td>Macrosiphum rosae</td>
<td>Aphididae</td>
<td>R. webbiana</td>
<td>Mar-Jul</td>
</tr>
<tr>
<td>14</td>
<td>Cavariella sp.</td>
<td>Aphididae</td>
<td>F. vulgare</td>
<td>Oct-Nov</td>
</tr>
<tr>
<td>15</td>
<td>Aphis affinis</td>
<td>Aphididae</td>
<td>M. longifolia</td>
<td>Apr-Jun</td>
</tr>
<tr>
<td>16</td>
<td>Uroleucon sp.</td>
<td>Aphididae</td>
<td>S. costus</td>
<td>Jul-Aug</td>
</tr>
<tr>
<td>17</td>
<td>Macrosiphonella pseudoartemisae</td>
<td>Aphididae</td>
<td>A. absinthium</td>
<td>Apr-Nov</td>
</tr>
<tr>
<td>18</td>
<td>Phordon cannabis</td>
<td>Aphididae</td>
<td>C. sativa</td>
<td>Jun</td>
</tr>
<tr>
<td>19</td>
<td>Cavariella biswasi</td>
<td>Aphididae</td>
<td>H. candidans</td>
<td>May-Jul</td>
</tr>
<tr>
<td>20</td>
<td>Brachyunguis harmalae</td>
<td>Aphididae</td>
<td>P. harmala</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>21</td>
<td>Aphis craccivora</td>
<td>Aphididae</td>
<td>S. nigrum</td>
<td>Jun-Nov</td>
</tr>
<tr>
<td>22</td>
<td>Periphilus aesculi</td>
<td>Aphididae</td>
<td>A. indica</td>
<td>Apr-May</td>
</tr>
<tr>
<td>23</td>
<td>*Longistigma cayae</td>
<td>Aphididae</td>
<td>S. alba</td>
<td>Aug-Sep.</td>
</tr>
</tbody>
</table>
## 5.2.4. Order Diptera

**Table: 4**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Insect Species</th>
<th>Insect Family</th>
<th>Hosts plants</th>
<th>Damage%</th>
<th>Incidence</th>
<th>Activity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chromatomyia horticola</td>
<td>Agromyzidae</td>
<td>A. rosea, A. lappa, A. absinthium, C. sativa, D. carota, M. neglecta, M. piperita, M. longifolia, N. cataria, P. somniferum, P. major</td>
<td>3-35%</td>
<td>3-65%</td>
<td>Apr-Oct</td>
</tr>
<tr>
<td>2</td>
<td><strong>Pegomya solensis</strong></td>
<td>Anthomyiidae</td>
<td>R. hastatus</td>
<td>5-100%</td>
<td>8-35%</td>
<td>Apr-Sep</td>
</tr>
<tr>
<td>3</td>
<td><strong>Pegomya hyoscyami</strong></td>
<td>Anthomyiidae</td>
<td>A. atropa</td>
<td>5-100%</td>
<td>5-8%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>4</td>
<td><strong>P. canicularia</strong></td>
<td>Anthomyiidae</td>
<td>C. album</td>
<td>8-100%</td>
<td>5-8%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>5</td>
<td><strong>Urophora quadrifasciata</strong></td>
<td>Tephritidae</td>
<td>C. iberica</td>
<td>10-15%</td>
<td>7-20%</td>
<td>May-Jul</td>
</tr>
<tr>
<td>6</td>
<td><em>Stemonocera cervicornis</em></td>
<td>Tephritidae</td>
<td>A. lappa</td>
<td>5-8%</td>
<td>5-10%</td>
<td>Aug-Oct</td>
</tr>
<tr>
<td>7</td>
<td>Silba lashkeri sp. nov.</td>
<td>Lonchaeidae</td>
<td>F. carica</td>
<td>100%</td>
<td>30-90%</td>
<td>Jun-Jul</td>
</tr>
</tbody>
</table>

## 5.2.5. Thysanoptera

**Table: 5**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Insect species</th>
<th>Host plants</th>
<th>Incidence</th>
<th>Activity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Coleothrips collaris</em></td>
<td>H. perforatum, O. normale</td>
<td>3-15%</td>
<td>Jun-Aug</td>
</tr>
<tr>
<td>2</td>
<td><em>Coleothrips mongolicus</em></td>
<td>H. perforatum, O. normale</td>
<td>3-15%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>3</td>
<td>Thrips tabaci</td>
<td>P. harmala, H. perforatum, A. mellifolium</td>
<td>4-25%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>4</td>
<td>Thrips garuda</td>
<td>P. harmala</td>
<td>15-20%</td>
<td>Jun-Jul</td>
</tr>
<tr>
<td>5</td>
<td>Thrips flavus</td>
<td>C. sativus, H. perforatum, P. vulgaris, P. amplexicuane</td>
<td>20-25%</td>
<td>Jun-Oct</td>
</tr>
<tr>
<td>6</td>
<td>Thrips alatus</td>
<td>H. perforatum, V. thapsus</td>
<td>30-33%</td>
<td>Jun-Jul</td>
</tr>
</tbody>
</table>
5.3. Parasitoid Host-Insect Catalogue

Table: 6

<table>
<thead>
<tr>
<th>S.No</th>
<th>Insect Parasitoid species</th>
<th>Parasitoid family</th>
<th>Host Insect</th>
<th>Insect Family</th>
<th>Activity range</th>
<th>Parasitic Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotesia glomerata</td>
<td>Braconidae</td>
<td>Pieris brassicae</td>
<td>Pieridae</td>
<td>Jul</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>C. ruficrus</td>
<td>Braconidae</td>
<td>Spodoptera exigua</td>
<td>Noctuidae</td>
<td>Jul</td>
<td>5%</td>
</tr>
<tr>
<td>3</td>
<td>Cotesia sp.</td>
<td>Braconidae</td>
<td>Vanessa cardui</td>
<td>Nymphalidae</td>
<td>Jun</td>
<td>27-30%</td>
</tr>
<tr>
<td>4</td>
<td>Microgastrus sp.</td>
<td>Braconidae</td>
<td>V. indica</td>
<td>Nymphalidae</td>
<td>May</td>
<td>10%</td>
</tr>
<tr>
<td>5</td>
<td>Venanides sp.</td>
<td>Braconidae</td>
<td>Aglaia kashmiriensis</td>
<td>Nymphalidae</td>
<td>Aug</td>
<td>20%</td>
</tr>
<tr>
<td>6</td>
<td>Parapanteles sp.</td>
<td>Braconidae</td>
<td>A. kashmiriensis</td>
<td>Nymphalidae</td>
<td>Jul</td>
<td>5%</td>
</tr>
<tr>
<td>7</td>
<td>Apanteles sp.</td>
<td>Braconidae</td>
<td>Pyrausta sp.</td>
<td>Pyralidae</td>
<td>Jul</td>
<td>12-15%</td>
</tr>
<tr>
<td>8</td>
<td>Apanteles sp.II</td>
<td>Braconidae</td>
<td>Unidentified noncuid</td>
<td>Noctuidae</td>
<td>Aug</td>
<td>98%</td>
</tr>
<tr>
<td>9</td>
<td>Ephedrus sp.</td>
<td>Braconidae</td>
<td>M.pseudoartemisae</td>
<td>Aphididae</td>
<td>May-Jul</td>
<td>5%</td>
</tr>
<tr>
<td>10</td>
<td>Bracon sp.</td>
<td>Braconidae</td>
<td>Chrysoesthia sexgutella</td>
<td>Gellichiidae</td>
<td>Jul-Aug</td>
<td>25-30%</td>
</tr>
<tr>
<td>11</td>
<td>Gnamptodon sp.</td>
<td>Braconidae</td>
<td>Pegomya canicularia</td>
<td>Anthomyiidae</td>
<td>Jul-Aug</td>
<td>60%</td>
</tr>
<tr>
<td>12</td>
<td>Charops sp.</td>
<td>Ichneumonidae</td>
<td>Callidrepana argenteola</td>
<td>Drepanidae</td>
<td>Sept</td>
<td>45%</td>
</tr>
<tr>
<td>13</td>
<td>Netelia sp.</td>
<td>Ichneumonidae</td>
<td>Cucilia verbasci</td>
<td>Noctuidae</td>
<td>Aug</td>
<td>15-20%</td>
</tr>
<tr>
<td>14</td>
<td>Ophion sp.</td>
<td>Ichneumonidae</td>
<td>S. exigua</td>
<td>Noctuidae</td>
<td>May-Jul</td>
<td>20-30%</td>
</tr>
<tr>
<td>15</td>
<td>Eulophus sp.</td>
<td>Eulophidae</td>
<td>Thysanoptilus orichalceae</td>
<td>Noctuidae</td>
<td>Jul</td>
<td>1.50%</td>
</tr>
<tr>
<td>16</td>
<td>Diglyphus guptai</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>Apr-May</td>
<td>60-65%</td>
</tr>
<tr>
<td>17</td>
<td>Diglyphus isae</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>Apr-May</td>
<td>45-60%</td>
</tr>
<tr>
<td>18</td>
<td>Chrysocharis viridis</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>May</td>
<td>3%</td>
</tr>
<tr>
<td>19</td>
<td>Chrysocharis sp.</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>May</td>
<td>15-17%</td>
</tr>
<tr>
<td>20</td>
<td>Chrysonotomys sp.</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>May</td>
<td>5%</td>
</tr>
<tr>
<td>21</td>
<td>Pediobius sp.</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>May</td>
<td>10-12%</td>
</tr>
<tr>
<td>22</td>
<td>Omphalentedo n sp.</td>
<td>Eulophidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>May</td>
<td>6%</td>
</tr>
<tr>
<td>23</td>
<td>Halictoptera sp.</td>
<td>Pteromalidae</td>
<td>C. horticola</td>
<td>Agromyzidae</td>
<td>Apr</td>
<td>3-5%</td>
</tr>
<tr>
<td>24</td>
<td>Capidosoma floridanum</td>
<td>Encyrtidae</td>
<td>Trichoplusia nigrisigna</td>
<td>Noctuidae</td>
<td>June</td>
<td>2-3%</td>
</tr>
</tbody>
</table>

* (new host plant records), † (new to Kashmir valley), ** (new to Indian region), # (new host plant record to India)
5.4 HOST PLANT-INSECT CATALOGUE

1. **Family Amaranthaceae**
   a) *Celosia argentea*
      Mir- *Lygus pratensis, Adelphocoris lineolatus*
      Rho- *Liorhyssus rubicundus*

2. **Family Anacardiaceae**
   a) *Rhus succedanea*
      Dre- *Callidrepana argenteola*
      Gra- *Eteoryctis syngramma*
      Noc- *Pyrrhia umbra*

3. **Family Apiaceae**
   a) *Coriandrum sativum*
      Noc- *Thysanoplusia orichalcea*
   b) *Daucus carota*
      Apr- *Poophilus costalis*
      Agr- *Chromatomyia horticola*
      Der- *Anthrenus picturatus, A. latefasciatus*
   c) *Foeniculum vulgare*
      Aph- *Cavariella sp.*
      Noc- *Thysanoplusia orichalcea.*
   d) *Heracleum candicans*
      Aph- *Cavariella biswasi*
      Der- *A. picturatus, A. latefasciatus*

4. **Family Araliaceae**
   a) *Aralia cachemirica*
      Geo- *Ascotis selenaria*
      Noc- *T. orichalcea*

5. **Family Asteraceae**
   a) *Achillea millefolium*
      Nit- *Euparea sp.*
      Thr- *Thrips tabaci*
      Mir- *L. pratensis, A. lineolatus*
Cor- *Nysius* sp.
Rho- *Liorhyssus rubicundus*

b) *Atractium lappa*
   
   Noc- *T. orichalcea, Trichoplusia nigrisigna*
   
   Nym- *Venessa cardui*
   
   Agr- *C. horticola*
   
   Tep- *Stemonocera cervicornis*

c) *Artemisia absinthium*
   
   Mir- *L. pratensis, A. lineolatus*
   
   Cor- *Nysius* sp.
   
   Rho- *L. rubicundus*
   
   Agr- *C. horticola*
   
   Aph- *Macrosiphonella pseudoartemisae*

d) *Centurea iberica*
   
   Bru- *Bruchidius tuberculatus*
   
   Nym- *Venessa indica*
   
   Tep- *Urophora quadrifasciata*

e) *Cynara cardunculus*
   
   Sca- *Protaetia neglecta,*

f) *Inula racemosa*
   
   Noc- *Helicoverpa armigera, H. peltigera*
   
   *T. orichalcea, T. nigrisigna*

g) *Sassurea costus*
   
   Noc- *H. armigera*
   
   Nym-V. cardui
   
   Oec- *Agonopterix pahalgami*
   
   Aph- *Uroleucon* sp.,

h) *Cichorium intybus*
   
   Apr- *Poophilus costalis*

6. **Family Balsaminaceae**

   a) *Impatiens balsamina*
   
   Chr- *Altica* sp.

   b) *Impatiens glandulifera*
chr- Altica sp.

7. **Family Berberidaceae**
   a) *Berberis lycium*
      Sca- *P. neglecta, P. impavida.*
      Cid- *Krisna sp.*
      Geo- *A. selenaria, Triphosa dubiosta*
      Atl- *Himalayrhynchites canus*

8. **Family Bergenaceae**
   a) *Bergenia ciliata*
      Cor- *Nysius sp.*

9. **Family Borginaceae**
   a) *Arnebia benthamii*
      Tin- *Dictyla nassata*
      Nym- *V. cardui*
   b) *Myosotis arvensis*
      Tin- *D. nassata*
      Nym- *V. cardui*

10. **Family Cannabaceae**
    a) *Cannabis sativa*
        Geo- *Ascotis imparata*
        Noc- *T. orichalcea*
        Tor- *Ulodemis trigrapha*
        Lym- *Euproctis scintillans*
        Aph- *Phordon cannabis*
    b) *Celtis australis*
        Gra- *Phyllonorycter sulaimani*

11. **Family Caprifoliaceae**
    a) *Sambucus wightiana*
       Sca- *Hopila polita*

12. **Family Chenopodiaceae**
    a) *Chenopodium album*
       Gel- *Chrysoesthia sexgutella*
13. **Family Fabaceae**
   a) *Lupinus polyphyllus*
      Lyc- *Lampides boeticus*
   b) *Trigonella foenum-graceum*
      Rho- *Corizus hyoscamy*

14. **Family Hippocastanaceae**
   a) *Aesculus indicus*
      Lyc- *Deudorix epijarbas*
      Cur- *Myllocerus sp.*
      Aph- *Periphyllus aesculi*

15. **Family Hypericaceae**
   a) *Hypericum perforatum*
      Thr- *Ceolothrips collaris, C. mongolicus,*
      Alt- *Thrips tabaci, T. flavus, T. alatus*

16. **Family Iridaceae**
   a) *Crocus sativus*
      Thr- *T. flavus*

17. **Family Lamiaceae**
   a) *Lavendula angustifolia*
      Apr- *Poophilus costalis*
   b) *Melissa officinalis*
      Chr- *Chrysolina coerulans bella*
   c) *Mentha longifolia*
      Chr- *Chrysolina coerulans bella*
      Pyr- *Pyrausta sp.,*
      Agr- *C. horticola*
      Aph- *Aphis aphis*
   d) *Mentha piperita*
      Chr- *Chrysolina coerulans bella*
      Agr- *C. horticola*
      Noc- *T. orichalcea, T. nigrisigna*
   e) *Nepeta cataria*
      Noc- *T. orichalcea, T. nigrisigna*
Agr- C. horticola
f) Nepeta sp.
   Pie-Pieris brassicae
g) Ocimum basilicum
   Mir- L. pratensis, A. lineolatus
h) Origanum normale
   Alt- C. collaris, C.mongolicus
   Cor- Nysius sp.
i) Prunella vulgaris
   Thr- T.flavus
j) Salvia sclarea
   Chr- Chrysolina coerulans bella
   Noc- T. orichalcea, H. armigera

18. Family Liliaceae
   a) Asparagus filicinus
      Chr- Crioceris asparagi

19. Family Malvaceae
   a) Alcea rosea
      Sca- P. impavida, P. neglecta
      Rho- L. rubicundus
      Phr- Pyrrhocoris apterus
      Mem-Leptocentrus sp.
      Noc-T. orichalcea, T. nigrisigna
      Hes-Carcharodus alcea
      Agr-C. horticola
      Cur-Cytozemia dispar
   b) Lavatera cachemiriana
      Phr- P. apterus
   c) Malva neglecta
      Agr- C. horticola

20. Family Moraceae
   a) Ficus carica
      Lon- Silba lashkeri
21. **Family Nymphaeaceae**
   a) *Nymphaea alba*
      
      Aph- *Rhopalosiphum nymphaeae*

22. **Family Onagraceae**
   a) *Oenothera glazioviana*
      
      Cur- *Cionus hortulans*

23. **Family Papaveraceae**
   a) *Papaver somniferum*
      
      Agr- *C. horticola*

24. **Family Plantaginaceae**
   a) *Plantago major*
      
      Noc- *T. nigrisigna, Spodoptera exigua*
      
      Agr- *C. horticola*

25. **Family Podophyllaceae**
   a) *Podophyllum hexandrum*
      
      Noc- *T. orichalcea, T. nigrisigna*

26. **Family Polygonaceae**
   a) *Polygonum amplexicaule*
      
      Thr- *Thrips flavus*
      
      b) *Rheum emodi*
      
      Noc-*T. orichalcea, T. nigrisigna, H. armigera, Mamestra brassicae, Mythimna sp.,*
      
      Arc- *Spilarctia obliqua*
      
      Lyc- *Lycaena phlaeas*
      
      Chr- *Altica sp.*
      
      Der- *A. picturatus, A.latefasciatus*
      
      b) *Rumex hastatus*
      
      Chr- *Altica sp.*
      
      Arc- *Spilarctia obliqua*
      
      Lyc- *Lycaena phlaeas*
      
      Ath- *Pegomya solensi*
      
      Apr- *Poophilus costalis*
27. **Family Primulaceae**
   a) *Primula denticulata*
      Noc- *Mythimna* sp.

28. **Family Punicaceae**
   a) *Punica granatum*
      Lyc- *Deudorix epijarbus*

29. **Family Ranunculaceae**
   a) *Aconitum heterophyllum*
      Tor- *Clepsis ruriana*
   b) *Aquilegia nivalis*
      Noc- *H. armigera*
      Sca- *P. neglecta*
   c) *Dipsacus inermis*
      Nit- *Euparea* sp.
      Apr- *P. costalis*

30. **Family Rosaceae**
   a) *Rosa sp.*
      Aph- *Macrosiphum rosea*

31. **Family Salicaceae**
   a) *Salix alba*
      Aph- *Longistigma carynae*

32. **Family Scrophulariaceae**
   a) *Picrorhiza kurroa*
      Sca- *Adoretus boops*
      Noc- *Agrotis ipsilon*
   b) *Verbascum thapsus*
      Noc- *Cucilla verbasci*
      Aph- *Aphis neri*
      Cur- *Cionus hortulans, Rinusa tetrum*
      Rho- *Corizus hyoscamy*
     Chr- *Aphthona nigrilabrus*
      Thr- *Thrips alatus*
      Mir- *Adelphocoris lineolatus*
33. **Family Solanaceae**
   a) *Solanum nigrum*
      Chr- *Psylloides brettinghami*
      Aph- *Aphis craccivora*
   b) *Atropa accuminata*
      Chr- *P. brettinghami*
      Nit- *Meligethes* sp.
      Noc- *H. armigera, Xestia c-nigrum, T. orchalea, Mammestra brassicae*
      Geo- *Ascotis selenaria*
      Arc- *Spilosoma erythrozona*
      Ath- *Pegomya hyoscamyi*
   c) *Datura stramonium*
      Pie- *Pieris dapladice*
   d) *Hyoscyamus niger*
      Noc- *H. armigera, H. peltigera*

34. **Family Urticaceae**
   a) *Urtica dioica*
      Nym- *Aglais kashmiriensis, V. cardui, V.indica*
      Pyr- *Pleuroptya sabinusalis*
      Arc- *Spilarctia obliqua*

35. **Family Zygophyllaceae**
   a) *Peganum harmala*
      Cur- *Myllocerus viridianus*
      Thr- *Thrips garuda, T. tabaci*
      Mir- *A. lineolatus, L. pratensis*
      Rho- *L. rubicundus*
      Noc- *Spodoptera exigua*
      Aph- *Brachyunguis harmalae*
Fig. I: Demand trend in quintals for MAPs in Kashmir Division

Fig. II: Relative proportion of insect orders and families infesting MAPs.
Fig. III: Lepidopterous families in terms of Species No., Host plant no., Mean incidence and Mean damage.

Fig. IV: Noctuid species in terms of Host plant/ Family No., Mean incidence and Mean damage.
Fig. V: Plant families and the No. of insect species associated with them

Fig. VI: Relative No. of plant species found infested under different families
Fig. VII: Stratification of insects infesting MAPs.

Fig. VIII: Proportion of vulnerable, new host records and new insect-host plant associations.
(I) CONCLUSION

Data interpretation reveals that out of 91 species of insects infesting MAPs in Central Kashmir, 82 per cent insect species were found active in lower reaches in wild habitats and cultivated avenues (gene banks and herbal gardens), 4 per cent species are specific to higher attitudes in sub alpine and alpine habitats and 14 per cent species are common to both habitats (Fig. VII) High incidence of insects attacking these plants at lower attitudes may be due to an array of factors like: varied climatic factors, habitat alteration, non planned mixing of plants in gene banks and herbal gardens involving both taxonomic and non taxonomic alliance, more vegetal growth at lower reaches coupled by monoculture, edaphic factors, poor cultural practices like lack of clean cultivation, absence of equilibrium between host insects, parasites and predators, etc.

Among all the natural agencies the climatic factors have a dominating influence on the survival, development and reproduction capacity of insect pests. High attitude environment is quite unique characterized by low air density, low O₂, CO₂ and water vapour content, high wind velocity, absence of trees, sparse vegetation and sub zero temperatures during major part of the year. Life cycle of nival insects is extremely short with an active period of development ranging between 6-8 weeks. Duration of dormancy is, however, much longer. Most of the species are univoltine and bivoltine species are totally unknown above timber line (3400-3500m) in alpine region. Therefore, high altitude insects exist in low population densities than those on the lower elevations. About 30 per cent of total nival insects fauna so far known from North West Himalayas are phytophagous and rest are either predators or scavengers. Above an elevation of 4000 mts and especially near the permanent snow line, hardly 10 percent of the insect species are phytophagous. Turbulent winds are another important factor at high elevations which affects dispersal and distribution of insects. The smaller frailer species of insects can fly up to short distances due to strong wind. They may be beaten by winds and perished to death. On the other hand low atmosphere pressure would appear to make flight mechanically difficult in much the same way as high wind velocities. All these factors do not act independently but
function as a single system having far reaching influence upon the population density which determines the damaging capacity or otherwise of an insect population.

Most of the insect species attacking these plants /crops at lower elevations are polyphagous and are attracted from other crops in vicinity like vegetables, fruits, grasses and fodder, etc. Let us take the example of *Rheum emodi*. In its natural habitat in alpine region, the species was found to be free of any insect infestation; but in herbal gardens and gene banks it was severely infested by grubs of leaf eating chrysomelid beetle, *Altica* sp. actually a pest of *salix* sp. Leaves of the plant also suffered extensive damage due to caterpillars of *Mamestra brassicae*, a common vegetable pest. Likewise, other common vegetable pests like *Thysanoplusia orichalcea*, *Trichoplusia nigrisigna*, *Spodoptera exigua*, *Helicoverpa armigera*, etc., got attracted to herbs like *Salvia sclarea*, *Inula racemosa*, *Sassurea costus*, *Podophyllum hexandrum*, *Rheum emodi* and *Aralia cachemiriana* in gene banks and herbal gardens and caused severe defoliation. Under natural conditions, even insects with a limited host range have been observed to feed on taxonomically diverse species of plants. Ghosh *et al.*, (1986) have reported cross infestation of cassava mites, *Tetranychus* spp. on banana and of thrips *Reti thrips syriacus* on *Leucaena*. In Brazil, bag worm, *Oiketicus kirbyi*, a pest of coffee, has been demonstrated to develop on eucalyptus leaves (Arce *et al*., 1987). Thus taxonomically distant species could be the hosts of insect pests.

In alpine region climatic conditions are adverse for the most part of the year, the plants growing there have to complete the entire life cycle starting from seedling, growth to sprouting of leaves, flowers, fruits and dispersal of seeds during the short growing season. Therefore, vegetative growth phase is very small, moreover, in these natural habitats only small, sparse and fragmented populations of the plants occur. In contrast, on lower elevations climatic conditions are favorable from early March to November and there is ample time for luxuriant vegetal and reproductive growth of plants. Nutritional adequacy coupled with reduced level of inhibitors / toxicants to the herbivore species may also lead to increased infestation at low elevations. Problem is further complicated by monoculture. This food resource concentration in one place supports uninterrupted population build up, because survival, development rate and
multiplication capacity of insects are all determined by quality and quantity of food. The food plants in pure strands are easily detected and colonized. Insects, particularly the specialists, exhibit longer tenure periods and higher feeding and reproductive success complemented with less disruption of host finding and lower mortality by natural enemies (Andow, 1991).

Taxonomic alliance may be another important factor for increased insect infestation in gene banks and herbal gardens. Plant species belonging to same taxonomic group may contain common or closely related bio chemicals. An insect feeding on a plant with certain biochemical make-up will adapt more easily to closely related plants with similar biochemical constituents than to species that have entirely different constituents because of taxonomic differences. This is exemplified/substantiated by *Psylloides brettinghami*, a flea beetle which was quiet frequently observed from middle of June to ending October on *Solanum nigrum* growing in wild. In the gene bank of CCRUM, Sgr, due to close association, the beetles from the plant migrated to leaves of *Atropa acuminata* and caused severe damage. Both the plant species belong to family Solonaceae. Szeoke & Takacs (1984) found that damage caused by the pod borer, *Etiella zinckelia*, in peas was accentuated by the presence of acacia trees in vicinity.

In *Pickrorhiza kurroa*, edaphic factors seem to be responsible for outbreak of *Adoretus boops* and *Agrotis ipsilon*. Cow dung supplemented by dry sandy soil may favour the growth of white grubs and caterpillars and moreover, may augment the intra crop movement of the larvae. In nature the plant grows in rocky terrain covered by snow for most part of the year where the grubs and caterpillars are difficult to thrive.

Lack of clean cultivation practice seems to aggravate the spittle bug infestation on Lavender. The cercopid exhibits remarkable ability to execute high leaps and heavy infestation of bug on young plants of *Robinia pseudoacacia* and weeds surrounding the fields/ along the periphery of the field seem to reinforce the insect population on crop. Roseeto *et al.*, (1978) reported damage to rice field by spittle bugs that were adjacent to pastures in Brazil. Likewise, very high infestation rate up to 97 per cent on figs by
Silba lashkeri is due to non removal of fallen, rottened fruits from the orchards leading to reinfestation of the standing crops.

An understanding of above discussed interactions is thus a key element in designing an efficient pest management system for sustainable and coordinated exploitation of these wild plants which will ensure ecologically sustainable and economically equitable production and utilization system. Humans are part of natural systems and when we interfere, even with good intentions, we bring our incomplete ideas of utility and short term grains which can lead to unexpected consequences. This human tendency to over simplify, whether to save labor, profitability as through an attitude that regards nature as “Other” tend to perpetuate mistakes which in the long work against us. Taking cue from fast growing international market for the herbs, authorities in J&K have arisen to situation and are making efforts for conservation and economic exploitation of MAPs. For the first time in the history of J &K, 46 floricultural green houses have been set up in public sector. About 150 acres of land has already been brought under the monoculture of herbs like Podophyllum hexandrum, Aconitum heterophyllum, Picrorhiza kurroa, Sassurea costus, Rheum emodi, Berberis lycium, Prunella vulgaris, Lavatera cachemiriana, Datura stramonium, etc., (Anonymous, 2006). Recently established Jammu & Kashmir Medicinal Plant Board (JKMPB) launched a five year mega project under the name “Vanaspati van” to bring about 2400 hac of land under cultivation. No doubt, consciousness is the first step; it must have been followed by research, better choices and collective action. But it is paradoxical that prior to taking such mega projects no thorough work has been done so far regarding present scenario of various phytophagous insect species damaging these economically important plants and their biological control agents. A thorough knowledge of their distribution, pest status, life cycle, host plant complex, periodicity / phenology, mode of feeding, breeding, nature and extent of damage, their parasites and predators should have been worked out.

In view of the constraints discussed above we must re-learn how to work with nature and in this context it may be stated / advised that in situ conservation, (which is nothing but protection of natural habitats without disturbing natural process) may be
encouraged. Efforts must be taken to augment the natural habitats to come up and multiply of their own in order to eliminate biotic interference. The in situ method of conservation will not only serve protection and preservation of flora, but will play a major role in improvement of ecological balance of fragile Himalayan biodiversity hot spot region. Regarding commercial exploitation of MAPs, it is to be borne in mind that most of these plants are climatically adapted to highly specific localities. We must not force them to grow where it is convenient for humans, rather we must identify ecological neighborhoods which besides other factors have pollinators, parasites and polyculture may be somewhat close to though not equivalent to natural plant communities in a stable ecosystem or a system in ecological succession. There is some evidence to suggest that at a more regional level pest problems may diminish in a heterogeneous landscape where agro ecosystem mosaics are interspread among natural vegetation (Altieri, 1991). While practicing polyculture the mix of plant species should be altered until the right combination of plants is obtained as indicated by reduced number of pests and an increased number of predators and parasites. Any built-in elements of pest control in existing herbal crop mixtures should be identified and retained during the course of modern commercial cultivation. Moreover, the suboptimal interactions between plants, herbivores and natural enemies could be enhanced by adding or eliminating diversity from the system to augment natural enemy effectiveness in regulating herbivore densities. However, the most difficult aspect of polyculture is that each agro ecosystem must be treated as a distinct entity and assessed separately, since herbivore-enemy interactions will vary significantly depending upon insect species, field size, location, plant species combination and the surrounding vegetation. Moreover, pest complex in such mixed or polyculture systems may change with the age of system, therefore, continuous monitoring programmes are required.

During current study insects identified as inflicting damage to the plants comprise mostly of polyphagous and oligophagous insects which can thrive even under poor/random mixed cultures, if both the components belong to same or closely allied taxonomic group. A hypothesis to explain lower number of herbivores in diverse plant
communities proposes that the rate of emigration, rather than the rate of colonization, is the factor most affected by the presence of non-host plant in a mixed system. In a review of polyculture system, Andow (1938) reported that monophagous herbivores are more likely to decrease in diverse systems than polyphagous ones (61% versus 27.1%) and less likely to increase (10% versus 43.8%). So sagacious manipulation of crop mixtures is a must to minimize the damage and restrain polyphagous and oligophagous insects in polyculture systems.

Shortcomings observed during the study among parasitoids in terms of low parasitic index and phenological asynchrony with the early generations of the insect, resulting in massive crop damage, may automatically get ameliorated in polyculture ecosystems through conservation; which is the basic and major techniques in bio-control programmes. It involves manipulation of plant diversity so that the enemies, parasites/ predators colonize the habitat earlier in the season than the pest. Such engineered ecosystems will further ensure alternate prey, nectar resources and suitable microclimate to parasitoids and predators. This also prevents prey densities to fall below a certain threshold which often cause emigration of natural enemies from the area when their main prey is rare; especially during the off season of main crop. A greater potential for pest control in complex systems as compared with simple ones was demonstrated by an increased colonization rate by a generalist predator in experiments involving flower thrips 
*Frankliniella occidentalis* and the predator bug *Orius tristicolor* (Letourneau & Altieri, 1983). The same author reported increased visits of hymenopteran parasitoids in mixed crop assemblages as compared with pure strands of squash. Theunissen & Ouden (1980) reported regulation of populations of *Mamestra brassicae*, *Evergastis forficalis* and *Brevicoryne brassicae* due to predator enhancement as a result of co-cultivation of Brussels sprouts with *Spergula arvensis*.

Last but not the least it may be emphasized that before going for commercial exploitation of medicinal plants in the state, concerned agencies must seek expert advice from proficient researchers in various scientific fields like ecology, agronomy, entomology and pathology.
(II) SUMMARY
Continued onslaught of killer diseases like cancer, aids and nibbling disease like diabetes and arthritis coupled with side effects of synthetic drugs has drifted the interest of people globally from allopathic to natural system of medicine. Scientists in USA began a worldwide research and analysis of plants for treatment of cancer and other diseases. The cancer screening programme eventually analyzed 10 per cent of the total known plants species world over. Consumer response to the plant based medicines has brought global resurgence in the herbal trade. So awakening to the scenario and taking cue from the paradigmic shift and fast growing international market for herbs, authorities in J&K have responded well. For the first time in the history of J&K 46 herbal green houses have been set up in the private sector About 150 acres of land has already been brought under the cultivation of herbs like Lavandula angustifolia, Salvia sclarea, Alcea rosea, Dioscorea deltoidea, etc. Recently established J&KMPB launched a mega project Vanaspati van with the aim to bring 3000Hec of land under mono culture cultivation of medicinal herbs which is instrumental for the outbreak of pests.

Awareness and propagation being a tool and not an end in itself. It is paradoxical that prior to taking such mega projects no thorough work was done so far regarding various insect families damaging these plants and their bio control agents. Earlier difficulty has been met by various state and central agencies during conservation and commercial exploitation of these economically important plant species. Many of these plants fall prey to various insect species at different stages of their life cycle. Therefore, the research study entitled, “Survey and studies on some insects damaging medicinal and aromatic plants of Central Kashmir along with observations on the bio control agents of some of them”, was undertaken with the aim to generate base line data regarding insects damaging MAPs. of Central Kashmir and to explore the scope of insect bio control agents (Parasitoids and Predators) in any future biological control programmes against these harmful insects. The study was designed to achieve following objectives.
Survey, collection, preservation and identification of various insect species damaging medicinal and aromatic plants occurring in different wild and cultivated avenues, both at low and high altitude areas, of Central Kashmir.

Rearing of pests in the laboratory to study adults of pests, various parasites and predators.

Identification of bio-control agents parasites/predators (insects).

Identification of pest infested medicinal and aromatic plants along with their economic importance.

The thesis work is divided into 6 chapters. Chapter 1st includes general introduction about physiography, climatic features and vegetation with special reference to medicinal and aromatic plants of the study area. Economic importance and global resurgence in the trade of medicinal and aromatic plants has also been highlighted. Methodology used for collection, rearing, killing, preservation, mounting and microscopy of insects has been dealt with in detail in the 2nd chapter. A brief review of important and outstanding publications on various aspects of the study like, host range, ecology, nature and extent of damage, seasonal abundance, bionomics and biology of insects damaging these economically important plants and their bio control agents pertaining to different Zoogeographical regions of the world, has been carried out in the 3rd chapter. In the 4th chapter species recorded during the study have been illustrated. Host plants, localities, date of collection, geographical distribution and field/laboratory observations have been provided for each species. As a result of field collection and laboratory rearing of immature stages of insects 91 insects species under 5 orders and 36 families were identified inflicting various types and degrees of damage to leaves, stems, buds, flowers, fruits, roots and seeds. Apart from this 24 species of insect parasites/parasitoids and 11 species of insect predators, each under 5 families were found exerting control over these phytophagous /herbivorous insects. Three new species were recorded during the study. 14 species are being reported for the first time from valley and 12 are being reported for first time from Indian region, among which 2 species are new to Indian sub continent.
Order Lepidoptera was found most dominating in terms of species as well as the number of families, comprising of 35 species under 14 families. Most of these lepidopterans are defoliators. Species like, *Pleuroptia sabinusalis*, *Ulodemis trigrapha*, *Clepsis ruriana* and *Pyrausta* sp. are leaf rollers; *Deudorix epijarbas*, *Helicoverpa armigera* and *Lampides boeticus* are fruit borers while as *Chrysoesthia sexgutella* and *Eteoryctis syngramma* are leaf miners. Genus *Chrysoesthia* (Gellichiidae) is being reported from Indian sub continent for the first time. Whereas the species *Calidrepana argenteola* and *Eteoryctis syngramma* are being reported from valley for first time, with new host records. Genus *Agonopterix* is being reported for the second time from valley after a period of one hundred years with a new species. Among lepidopterans family Noctuidae was dominating with species *T. orichalcea*, *H. armigera*, and *T. nigrisigna* being rampant.

Order Coleoptera was found to be second only to Lepidoptera both in terms of species and family number with 20 species under 7 families. Most of the coleopterans recorded are florivores and leaf feeders while some being seed eaters and root feeders as well. Among the florivores are *Protetia impavida*, *P. neglecta*, *Hopila polita*, *Euparea* sp., *Meligethes* sp., *Rhinusa tetrum*, *Cionus hortulans*, *Anthrenus picturatus* and *A. latefasciatus*. Seed feeding bruchid, *Bruchidius tuberculatus*, is a new record from Indian sub continent while as florivorous dermestid beetles *A. pictoratus* and *A. latefasciatus* are new to Indian region. Equally important among the coleopterans are leaf eating beetles like *Altica* sp., *Chrysolina bella*, *Aphona nigrilabrus*, *Psylloides breathinghami* and *Crioceris asparagi*, which cause havoc in case of plants like *Atropa acuminata*, *Solanum nigrum*, *Rheum emodi*, *Impatiens balsamina*, *I. glandulifera*, *Verbascum thapsus*, *Asparagus filicinus*, *Mentha longifolia* and *Mentha piperita*. Among chrysomelids *C. asparagi* is being reported for the first time from Indian region. New coleopterous records to the Kashmir valley during the study include; *Chrysolina coerullans bella*, *Adoretus boops*, *Euparea* sp., *Meligethes* sp., *Rhinusa tetrum* and *Cionus hortulans*. White grubs of *Adoretus boops* caused devastation in *Picrorhiza kurroa*. 
Among dipterans leaf miner fly *Chromatiomyza* (*Phytomyza*) *horticola* was most rampant. It was recorded on eleven host plants; *Papaver somniferum*, *Plantago major*, *Alcea rosea*, *Arctium lappa*, *Malva neglecta*, *Mentha piperita*, *Mentha longifolia*, *Nepeta cataria*, *Cannabis sativa*, *Daccus carota*, *Artemisia absinthium*. Although showing narrow host spectrum maggots of the genus *Pegomya*; *P. hyoscyami*, *P. solensis* and *P. cuninculari* exhibited high incidence and formed blotch mines on the leaves of *Rumex hastatus*, *Chenopodium album* and *Atropa acuminata* respectively. The group is being reported for the first time from Indian region. Detection of range extension of Mediterranean fig fly, *Silba* sp. to Indian sub continent during the present study has sounded alarm to fig production in the region. A new species of the genus, *Silba lashkeri* was found causing intensive damage to fig fruits. Fruit fly *Urophora quadrifasciata* being a new report from Indian region was encountered on *Centurea iberica*. Maggots of the fly feed on the developing endosperm of seeds and cause marked reduction in the seed production. *Stemonocera cervicornis*, new to valley was found causing blotch mines on the leaves of *Arctium lappa*, a new record for the species.

Spittle bug, *Poophilus costalis* Walker (Hemiptera: Cercopoidea: Aphrophoridae) was detected as a constraint for commercial exploitation of *Lavandula augustifolia*. Though reported from various part of India on rice, sugar cane, etc, the super family is being reported for the first time from valley. Most of the heteropterans recorded during the study are polyphagous, though a few like *Dictyla nassata* and *Pyrrhocoris apterus* are oligophagous and are economically more important. Among hemipterans the new records from India include *Adelphocoris lineolatus*, *Pyrrhocoris apterus* and *Corizus hyoscyami*; while as the new records from valley include *Dictyla nassata*, *Poophilus costalis* and *Longistigma caryae*.

A total of 69 species under 35 families were recorded as host plants during the study. These include 25 new host records and 51 new insect-host plant associations. Out of these 69 host plant records 13 plant species (18.8 per cent) fall under the category of threatened plants by Kaul (1997). Among the host plants few species like *Urtica dioica*, *Verbascum thapsus* and *Centurea iberica* despite their medicinal
importance in various systems of medicine are turning invasive because of their high seed banks and great power of dispersal. Various herbivorous insects recorded on these species during the current study may qualify as bio control agents to keep the population of these plants under check.

Among bio control agents parasitoids dominated the scene. Some of them were observed to be of common occurrence causing heavy parasitism in their respective hosts and seem to have great scope in suppressing the insects damaging these economically important plants. It transpires from the data that out of 24 species of parasitoids bred from the host insects, 14 species, i.e., 58 per cent, infest most dominating group, Lepidoptera. But the fact remains that among Lepidoptera the most important species observed, in terms of injury inflicted, during the current study like *Trichoplusia ni*, *Mamestra brassicae*, *Agrotis ipsilon*, *Helicoverpa armigera* and *Diacrisia obliqua* did not suffer from parasitism and on others like *Spodoptera exigua* and *Thysanoplusia orichalcea*, parasitism was least around 5 per cent. In most of the lepidopterous larvae parasitism was observed in the month of July when much of the damage was already suffered by the plants.

5th chapter embodies medicinal importance of the host plants, catalogues/ tables and graphs. 6th chapter encompasses the conclusion arrived at from the study with a brief summary of the thesis work. References, scope for further research on the topic, abbreviations used in the text, photographic plates and line drawings are appended at the end.
SCOPE FOR FURTHER RESEARCH

1. Major insect species inflicting damage to the plants of medicinal importance must be subjected to rigorous research both in field and laboratory to cover their biology and ecology under different agro ecosystems, focusing on the predisposing factors affecting their population build up.

2. Short comings and constraints observed in terms of low parasitic index and absence of parasitization in the most destructive and rampant species demand to be worked out.

3. Research needs to be carried out by conducting field trails in polyculture rather than monoculture. Since most of the insect species found inflicting damage during the study are polyphagous and oliophagous, taxonomic alliance must be given due importance during the course of these research trials. Results thus achieved would help in selecting optimal plant combinations. Moreover, the field trials must be proficiently designed to avoid insects in time and space by earmarking locations where plants are not easily accessed by the insects or by changing seasonal growth patterns.

4. Periodic entomological surveys must be carried out to assess changes in pest complex that often take place with the age of system due to an array of factors like changing agronomic practices, changing plant combinations, pesticidal sprays, anthropogenic activities, etc.

5. Pollination biology and ecology of high altitude alpine species like *Arnebia benthamii*, *Sassurea costus*, *Aconitum heterophyllum*, etc. need to be explored to account for failure to set seeds at lower altitudes.

6. Studies on insect physiology, genomics and population genetics may enable us to understand plant-insect interactions in natural and agricultural ecosystems which can be helpful to reduce the rate at which insects evolve tolerance to natural plant defenses.

7. Role of insect species in disease transmission among these economically important plants is yet another vast area for research.