Chapter-1

Introduction

Chamomile (*Matricaria recutita* syn. *M. Chamomile*: Sub family: Asteraceae, family: Compositae) is an important medicinal plant and a natural source of essential oil (blue oil) (Svab, 1979). It belongs to members of many genera, out of which only three botanically distinct genera viz., *Chamaemilum* (Anthemis), *Ormenis* and *Matricaria* are important. On the basis of oil production *Chamomiles* are of three groups viz. Roman, which is also called sweet or English *Chamaemilum nobilis* or *Anthemis nobilis* Linn., *Ormenis multicaulis* Braun-Blanquet and Maire (*Moroccan Chamomile*) and Scented Mayweed or Blue *Matricaria recutita*. Presently, it is familiar as German *Chamomile*. It is widely cultivated in about 40 countries in the world i.e. Switzerland, France, South America, Argentina, Africa, Egypt, Morocco, Bulgaria, Russia, Germany, Hungary, Yugoslavia, etc (Lal *et al.*, 1993). The major exporting countries are Argentina, Egypt, and Warsaw Pact countries. In India, it is reported to be grown in Punjab, Himachal Pradesh and upper Gangetic plains. Since it has been very extensively cultivated and used in Germany, it is also known as German *Chamomile* or Hungarian *Chamomile*. It has a pleasant aromatic odor and bitter taste. The dried flowers of Chamomile are age-old medicinal drug known in ancient Egypt, Greece and Rome. In Egypt, *Chamomile* is a religious plant consecrated to the Sun God. Approximately, 7000-8000 tones flower, and 9-10 tones oil are produced in the world and 40-50% of the production is used in Germany alone. In India, Chamomile is called as “Gule Babunah” or simply “Babunah” in Hindi and “Thulabul” in Kashmiri *Chamomile* word originated from Greek world ‘chamos’ means ground and ‘melos’ means apple (Ghauri *et al.*, 1984). In India, the plant was
introduced in the Punjab region by the Mughals about 300 years ago and it is being cultivated in the adjoining areas for the past 200 years (Shah, 1980). *Chamomile* oil is extensively used in herbal and homeopathic medicine, in aroma therapy and massage therapy. *Chamomile* is marketed as dried flower, as essential oil and extract (by solvent extraction), but steam distilled oil is much preferred. The *Chamomile* flower, *Chamomile* petals and *Chamomile* pollens have separate market values. It finds use in food industry, pharmaceutical, cosmetic industries and biological weed control (Crevin and Philpott, 1990).

![Chamomile Plant](image)

Figure 1. *Chamomile* Plant
On the other hand the genus *Chlorophytum* is represented by about 175 valid taxa of rhizomatous herbs, distributed predominantly in tropical forest of the world; some of these species are reported to be cultivated for their ornamental values. Out of these, 13 species are reported to occur in India. At least 6-7 *Chlorophytum* species are supposed to be collected and used in indigenous system of medicine and the roots of all the species are referred to as Safed musli. However, *Chlorophytum borivilianum* Santapau and Fernandes is preferred over other species, and fetches higher prices due to its better medicinal properties.

*C. borivilianum*, commonly known as Safed musli (Fig. 2) is a traditional medicinal plant which belongs to family *Liliaceae*. The genus includes about 300 species, which are distributed throughout the tropical and subtropical parts of the world. Tropical and subtropical Africa is the probable centre of origin of the genus, where about 85% of the species are found. In India *C. borivilianum* is mainly distributed in southern Rajasthan, north Gujrat and western Madhya Pradesh (Maiti and Geetha, 2005).

Thirteen species of *Chlorophytum* have been reported from India (Sheriff and Chennaveeraiah, 1972). All these species differ in appearance; native species are sold as ‘Safed musli’ in the Indian drug market. Amongst these, *C. borivilianum* produces the highest yield and highest saponin content (Sheriff and Chennaveeraiah, 1972). Other important indigenous species are: *C. arundinaceum, C. tuberosum, C. laxum,* and *C. breviscapum*.

*C. borivilianum* is a small perennial herb with a full crown of radical leaves appearing over the ground with the advent of summer rain. Its root tubers are fleshy, fascicled and directly originate from the stem disc devoid of any fibrous structure.
They are cylindrical and 5 -20 in number. It has 6 -13 radical leaves spirally imbricate at the base, sessile in nature, linear or ovate with acute apex and slightly narrowed at the base. The leaves spread horizontally, with smooth surfaces, wavy margins and parallel venation.

Flowers of *Chlorophyllum* are small, white, bracteates, pedicillate, zygomorphic, usually arranged in alternate clusters, each cluster comprising of 3 flowers. The flower clusters are dense on the upper part of the scape; bracts are linear, papery and purplish, 1.0 -10.5 cms long; pedicle whitish and 6 -10 mm long. It bears green to yellow colored fruit which is almost equal in length and breadth. Seeds are endospermic, onion-like, black colored and angular in shape.

Among the medicinal *Chlorophyllum* species reported in India, each species has a specific area of occurrence. For example, *C. arundinacium* Baker has been reported to occur in all districts of Chhota Nagpur, parts of Central India and foot hills of North-East Himalaya in Assam, West Bengal and Bihar. *C. attenuatum* Baker mostly occur in Western Ghat from Karnataka southward to Coimbatore. The forests areas of southern Rajasthan, western Madhya Pradesh and north Gujarat are the natural habitats of *C. borivilianum* (Shah, 1978). Until few years back, these forests were very rich in *C. borivilianum*. However, the continued collection of plants from these areas resulted into fast depletion in its population. There can be several reasons for fast depletion of Safed musli population in natural habitats such as the low rate of multiplication of Safed musli plant through vegetative means, shy flowering behavior, formation of only few boles (in which the seeds are enclosed) on each inflorescence, very less number of seeds formed in each bole and very low germination (11-62%) of seeds (Maiti and Geetha, 2005).
Since a long time, wild growing plants have been the major source of supply of drug to industries. However, over exploitation of natural resources has dwindled the population of Safed musli in its natural habitats. Accordingly, the availability of roots from wild resources has gone down rapidly. Now it is widely realized that if immediate steps for the conservation of Safed musli are not taken, Indian forest will soon loose this valuable plant.

The current annual demand of Safed musli roots in India is estimated to be 3500 tones as against the supply of 500-600 tones. Thus, the poor availability of drug in the market at one hand and the increased demand of roots for internal consumption and export on the other, has created spurt in prices of Safed musli. Until middle of last decade of 20th century there has been no serious attempt for the domestication and systemic cultivation of Safed musli in the country. However, the unprecedented increase in the prices of roots in the last few years has necessitated systematic cultivation of Safed musli (C. borivilianum) in different suitable agro climatic zones in the country. In recent years, musli cultivation has been taken up by a number of growers in Maharashtra, Madhya Pradesh, Chhattisgarh, Rajasthan and U.P. However, the musli growers are faced with a number of problems, the most important being the non-availability of appropriate cultivation and intercropping chlorophytum with bottle gourd, pigeon pea and maize.

Indian herbal industry is at a blooming stage now-a-days. There is an increasing awareness towards consumption of herbal medicines. The world health organization (WHO) has estimated that more than 80% of the world population in developing countries depends primarily on herbal medicines for basic health care needs (Canter et al., 2005). Large numbers of plants have medicinal properties like
Aloe, Jatropa, Satavari, *Piper methystium*, and Ginkgo, etc. One of such important medicinal plant is *C. borivilianum* Santapau and Fernandes.

Major biochemical constituents of Safed musli are carbohydrates 42%, protein 80-90%, fibers’ 3 - 4%, saponins 2 -17% and alkaloids 15 - 25%. (Bordia et al., 1995). Primarily saponins and alkaloids impart medicinal value. *C. borivilianum* has therapeutic application in Ayurvedic system of medicine (Kirtikar and Basu, 1975). Generally, it is considered very good to increase General Body Immunity. Its aphrodisiac properties have proved very much useful for the people suffering from erectile dysfunction and to increase male potency. It has spermatogenic property and helpful in curing impotency as they are rich in glycosides.

Safed musli is considered as a curative of natal and post natal problems and a cure for diabetes and arthritis. Its root powder is fried in the ghee and chewed in case of aphthae of mouth and throat. It is effective in curing rheumatism and joint pains. It is an essential part of a traditional diet of mothers (after delivery) in the form of "Laddoos". Efforts in countries like U.S.A and England are also on to convert it into chips/flakes to use it as a nutritious breakfast. Gujarat State Forest Development Corporation launched a potency drug by name NAI CHETNA (The Indian Express, 1st December 1999) that has been enjoying widespread publicity with increasing acceptance as an alternative to “Viagra”.

Safed musli is traditionally used for lack of libido male impotency, oligospermia. It is also widely used as a general health promotive tonic and for delaying the ageing process. Varying its common use for health promotion, it is also used for increasing lactation, treating various gynecological disorders. As such Safed
musli has no adverse effect if taken in a proper dose while hyper dosing may lead to gastrointestinal disorders.

![Image of Safed musli plant](image)

**Figure 2.** Plant of Safed musli growing in the field.

It grows naturally in most parts of Central India where climatic conditions are suitable for the cultivation of safed musli. This plant can grow well in a range of temperature and rainfall conditions. A sandy loamy soil with adequate drainage is ideal for its production. Normal pH range, higher dose of super phosphate, decomposed farmyard manure and good drainage system facilitates better tuber growth. It is usually found in soils rich in organic matter and requires bright sunlight (Oudhia *et al.*, 2001). Cultivation of Safed musli usually begins with land preparation in the months of April/May. After the field is ploughed, available farmyard manure or any form of compost is applied and mixed well with the soil. The soil can also be enriched by growing a green manure crop such as sun hemp and incorporating it at the flowering stage. If the soil is too dry, the field can be irrigated to ensure easy decomposition of green manure.

Safed musli is sown with the onset of the monsoon. Fingers are separated from the bunch of tubers with the crown and disc kept intact. They are planted at a distance
of about 25 cm within the row. The planting density is about 80,000 fingers per ha, weighing approximately 400-500 kg. Before planting, the fingers can be treated with 50 g of Bavastin, that is mixed with 15 litres of water to prevent fungal attack (Kothari and Singh, 2003; Maiti and Geetha, 2005).

In the present study two cultivars (Chamomile and Safed musli) were used for the isolation of chemical constituents by the new mediculture cultivation patterns. The present research work based on the following objectives-

1- To study intercropping between *Chamomile* and Chick pea.

2- To study intercropping with different crops i.e. Maize, Bottleguard and Pigeon pea with Safed musli.

3- To isolate chemical constituents of Safed musli and Chamomile.