Literature Review:-

The discovery that plant extracts can produce a positive Allen-Doisy test was made even before structural elucidation of the endogenous animal estrogens (Dohrn, et al, 1926; Loewe and Spohr, 1927). Later, Butenandt and Jacobi (1933) obtained a crystalline substance from palm kernel residues which appeared to be identical with the animal estrogenic hormone(I). Simultaneously, Skarzynski (1933) isolated another estrogically active compound from Willow catkins. It resembled estriol(II) in microscopic appearance, solubilities, UV – spectra and melting point. In addition, Hassan and Wafa (1947) and El Ridi and Wafa (1948) isolated an estrogenic substance from pollen grains of the date palm, which was assumed to be estradiol (III). A wide distribution of nonsteroidal estrogens in plants led some authors to question the real steroidal nature of the above estrogens found in plants (Jacobson, et al., 1971). These doubts were ultimately proven to be unfounded when various authors confirmed the presence of steroidal estrogens in various plants. Thus, estrone was found in the pollen grains of date palm, in pomegranate seeds, in the roots of moghat, Clossostemon bruguieri (L); in the seeds of Prunus and in Phaseolus vulgaris (L) (Amin, et al ,1969; Awad, 1974; Bannett, et al , 1966; Heftmann, 1968 ; Young, et al , 1977).Steroidal estrogens are mainly present in the reproductive parts of plants (petals, pollen grains, ovary, fruits and seeds too). They seems to be less abundant in the stem and green leaves, though present sometimes in the roots. Possible biosynthetic pathways of the animal steroid hormones in the plants have been reviewed several times by Heftmann (1968 , 1974, 1975, 1977).

It is generally assumed that steroidal estrogens are produced in the higher plants from cholesterol by biosynthetic pathways similar to those in animals (Heftmann, 1975). Recently, evidence has been provided (Young, et al ,1977) that steroidal estrogens can be formed in plants from mevalonic acid. There are certain indications that steroidal estrogens also affect growth and reproduction in plants. For example, they have beneficial effects on growth of intact pea plants and stimulate growth of excised embryos (Bonner and Axtman, 1937; Helmkamp and Bonner, 1953). In analogy to their reproductive functions in animals, steroidalexestrogens were reported to accelerate growth in Euglena gracilis (L) (Buetow and Levedahl, 1960) or to promote flowering in such diverse plants such as Lemma minor (L) (Czygan, 1962); Cichorium intybus (L) (Kopcewicz, 1970) and Salvia splendens (L) (Kopcewicz and Porazinski, 1974). In Melandrium dioecum (L), estrogens stimulated germination of the seeds and cell division in the
roots. What is more important, estrogens suppressed the anther growth and influenced the plant in female direction, whereas the male androgenic hormone testosterone conversely suppressed growth and influenced the dioecious herb in a male direction (lowe and Lowe, 1945).

However, treatment of cucumber plants with either 17beta-estradiol or testosterone induced femaleness in the flowers (Gawienowski, et al, 1971). Provided that, these analogies in the developmental responses of plant and animal tissues to steroid hormones would be of general occurrence, it may open a new and important aspect of chemical ecology. In contrast to the well defined structure – activity relationships among steroidal estrogens, several reports on estrogenic activity of stosterol (IV) isolated from the roots of licorice, Glycyrrhiza glabra (L) have appeared (Hassan, et al., 1964; Van Hulle, 1970; Zayed, et al., 1964). This being true, all higher plants ought to be more or less estrogenic due to the ubiquitous presence of sitosterol in plants. Extensive search in literature revealed a excellent background regarding presence of one of the most potent animal estrogens, namely ESTRIOL (II) in the roots of Glycyrrhiza glabra (L). It is likely, therefore, that the reported hormonal activity of sitisterol can be due to it’s contamination by minute traces of estriol.

Whole series of taxonomically unrelated plants has been shown to provide extracts that exhibit positive Allen – Doisy Tests in mammals (Bradbury and White, 1954). Chemical analysis of some of these extracts revealed the presence of estrogenically active compounds that differed considerably in structure and biogenetic origin from the true animal hormones. Some of these phytoestrogens, for instance isoflavones, were known to occur in plants long before their estrogenic properties were recognized. The ecologically more important phytoestrogens were discovered after searching for the causes of hyperestrogenic syndromes in some domestic animals. Phytoestrogens may be considered as pharmco – biological mimics of the animal estrogenic hormones. The extensive literature concerned with the distribution of phytoestrogens in plants has been reviewed, which belong to authors: White (1954); Moule, et al (1963); Bickoff (1968); Rolinski (1969); Krause (1970); Chury (1971); Stob (1973) and Doecke (1975). Serious breeding problems in sheep, grazing on subterranean clover (Trifolium subterraneum) pastures in Western Australia provided strong presumptive evidence for the presence of estrogenically active factor in this pasture plant. The symptoms included: infertility of the female; dystocia; uterine inertia and prolapsed of uterus (Bennetts, et al.,1946). Later Bradbury and White (1951) isolated two estrogenically active products from the extract of subterranean clover.
They were identified as isoflavones, formononetin(V) and genistein(VI). Other estrogenic isoflavones that have subsequently been found in clover and other plants include: Prunetin (VII); Biochanin – A (VIII) and Pratensein (IX).

Some of these secondary plant substances are frequently present in the Leguminosae, where they occur quite commonly in the form of Glucosides. For example: Genistein 7 – gluciside (XI) and Daidzein (X), the glucoside of which is known as Daidzin (XII) were found in the beans of *Soja hispida* (L) (1931) by Waltz. Tatlancuayin (XIII), isolated from a Mexican plant, *Iresine celocioides* (L) (Amaranthaceae) by Crabbe, et al (1958). This compound was also found with estrogenically active. Bickoff, et al (1957) noted that, the extracts of certain forage plants contained potent estrogenic fractions that did not contain isoflavones. The active agents were important estrogens of strawberry clover, ladino clover and alfalfa. One of them was identified as a Benzofurocoumarin derivative named Coumestrol (XIV). Bickoff, et al (1964) subsequently isolated trofoliol (XV) from ladino clover. Another estrogenically active benzofurocoumarin is Psoralin (XVI) isolated from *Psoralea corylifolia* (L) (Datta gupta, et al, 1960).

With reference to the present work, attempt is concerned with screening the acetone extractive of some selected non-mulberry plants for Juvenoid contents; their quantification and utilization in the improvement of quality of cocoon and silk filaments. Being a lepidopteron insect, Silk worm *Bombyx mori* (L) exhibit typical life cycle, which include the life stages like egg. Five larval instars, pupa within a cocoon & adult moth. larval instars deserve special feature with reference to voracious feeding on the mulberry leaves & holometabholus metamorphosis. Each larval instar is having particular life pattern with specific profiles of proteins, lipids, carbohydrates, enzymes &other compound. The mature fifth instars larva spin the silky cocoon around its body & change itself into a pupa through the process of metamorphosis. The pupa get converted into adult moth, which emerge out piercing the shell of cocoon. After mating, the adult female moth lays the eggs & life cycle get continued. The titres of neuroendocrine hormones like juvenile hormone (JH) & molting hormone (MH) serve to orchestrate the process of metamorphosis in the insects, like silkworm *Bombyx mori* (L). The juvenile lormone (JH) is the product of corpora allata & molting hormone (MH) belong to the prothorasic gland. With reference to functions the JH & MH act antagonistically. Molting hormone (MH) regulate the process of ecdysis. The juvenile hormone (JH) decides the quality of
molt through the process of inhibition of chitin in the tissues of developmental stage of insect (Staal, 1967).

There are many compounds exhibiting the actions analogous to the natural juvenile hormone (JH) of the insects like silkworm, *Bombyx mori* (L). Such compounds are called as Juvenoids or Juvenile hormone Analogues (JHA). The Juvenoids are classified into two groups, such as: synthetic & natural. The compounds like methoprene, kinoprene, hydroprene, such & others are the synthetic compounds. The natural Juvenoids are animal derived & plant derived. The natural & synthetic Juvenoids are concerned with regulation of metabolism like protein synthesis, enzyme activity & prevention of sclerotization of cuticle (Slama, 1968).

The phytophagous insects derive the nutrients & other metabolites through the plants. The interactions of plant metabolites with the insect issue get reflected into the status of insect life (slama, 1968). The juvenobid activity has been identified in some south Indian plants. And, it is postulated that, mulberry, *Morus alba* (L) may have the compounds analogous with natural JH and MH (Prabhu & Gopkumar, 1973 & 1977). Slama (1979&1980) reported the involvement of insect hormones & anti hormones in the interaction with secondary plant metabolites. The insect tissue use to regulate the plant metabolite titres & utilize for its life. The plants reported for insect Juvenoid activity include:

- *Vitis vinifera* (L)
- *Santalum album* (L)
- *Cocos nucifera* (L)
- *Morinda tinctoria* (L)
- *Nyctanthes arbor* (L)
- *Acalypha hispida* (L)
- *Bauhinia acuminata* (L)
- *Malvaviscus populinus* (L)
- *Hibiscus rosasinensis* (L)
- *Anacardium occidentale* (L)
- *Tectona grandis* (L)
- *Pterocarpus cadamba* (L)
- *Terminalia tomentosa* (L)
- *Lantana camera* (L)
There are reports on the topical application of extractives of plant like *Vitis vinifera* (L); *Tectona grandis* (L); *Lantana camera* (L) & *Santalum album* (L) to the larval instars of silk worm *Bombyx mori* (L), which are with the conclusion of the juvenoid activity in the plants (Akai, 1981; Washida, 1984; Vitthalrao B. khyade, et al, 2002,2004,2005,2006,2009,2012,2004). The herbal drug also reported for improvement in the activity of mid gut enzymes in the fifth instar larvae of silkworm *Bombyx mori* (L) (Vitthalrao.B.khyade & Jyoti Kulkarni 2011; Vitthalrao Khyade & Sucheta Doshi, 2012). Attempt on the use of acetone maceratives of Teak, lantana, santalum,& Vitis for improvement of health of larval instar of silkworm *Bombyx mori* (L) has also been recorded in the laboratory study (Sharad G. Jagtap, 2007).

However, there is need to establish feasible technology on the use of plant extractives to improve the life of larval instars of silkworm *Bombyx morio* (L) & thereby the quality of cocoons spinned by them. There should be attempt towards ‘Lab to Land’ to utilize the plant metabolites improving growth & life of larval instars of silkworm *Bombyx mori* (L). With this background, the study on “Influence of plant extractives on silkworm *Bombyx mori* (L)” has been Planned.