Review Of Literature
The activities of ectoparasitic insects may decrease the fitness of man, his domestic animals, and wild hosts through irritation, damage to the skin and transmission of pathogenic organisms. The domestic animals populations of ectoparasites may reach high levels. On wild host populations these are generally low, kept thus both by host activities such as grooming and perhaps by an immunological response. Ectoparasites presumably seldom affect the health of wild hosts.

2.1 PARTICULARS OF CATTLE

Different breeds of cows have also been studied and examined with specific observations. The informations based on different parameters of the selected references are given as below-

Kamarianus *et.al.* (2003), examined presence of environmental pollutants in the semen of bulls in farm animals. Saijpaul *et. al.* (1999) observed the reproductive efficiency of crossbreed heifers after feeding the wheat straw supplemented by
the urea and sulphur. Boadi et.al. (2002), used SF6 tracer gas techniques for the measurement of CO$_2$ and CH$_4$ production in cattle. Organophosphorus Pesticide was traced out in the milk by the sales et.al. (2003), and Wieczorek- Jaroslaw (2003) examined the effect of excessive supplement of Sulphur with some other antioxidant in young cattle.

In the dairy farms in Australia the improvement on commercial level was performed by the Gourley-Cameron (2004). Armendariz et.al. (2004), performed the gas chromatographic determination of Organochlorine pesticides in cow milk. Otim et.al (2004) studied on the disease and vector constraints affecting cattle production in Uganda, and Botteon et.al (2003) observed the disease prevalence, causes of mortality and treatment appliances in dairy calves in Brazil and some symbiotic relationship was also established in domestic cattle by the (1999). Dego et.al. (2003), observed Weeks-Paul bovine mastitis in selected areas of Southern Ethiopia. Maia et.al. (2003) reffered to about the genetic adaptive study and rousing et.al. 2004 studied on the behavioural aspects of milking cattle. Heinze et.al. (1993), examined the efficacy of Pomefrin against ecoparasites of cattle.
An animal parasite is arbitrarily defined as a smaller animal that lives at the expense of a larger animal called host. The field of veterinary parasitology is here with arbitrarily limited to the Helminth and Arthropod parasites of the domestic animals. The parasitologists in different countries have drawn their attention to the menace of parasitism of their livestock. On the basis of attachment and extracting the nourishment the parasites are considered mainly of two kinds viz. ecto- and endo-parasites. In the host-parasites relationship, the parasite extracts sufficient nourishment to maintain and propagate itself, and not impairing too much the vitality of its host, which provides it a home and a free ride. The host also succeeds in protecting itself against the injurious effects of the parasites, partly by developing antibodies which neutralize poisonous or injurious products of the parasites and partly by placing the blood forming or tissue repairing mechanisms on the place of higher efficacy, and partly by less well understood immune mechanisms enforcing birth control.

While the endo-parasites have been more thoroughly attended to the ectoparasites have failed to receive that elaborate attention. Again while, cattle have received the best attention. The common arthropodan parasites that affect other
livestock also affect cows and include ticks, lice, mites and flies and it should not be out of place to review the work done in respect of them.

Pruett et al. (2003) has been reported the majority of parasites affecting a herd of animals are harboured by relatively few very susceptible hosts within the herd. Those few animals are responsible for maintenance and transmission of the parasite population to the more resistant animals. This observation has long held the promise of ectoparasite controlled by natural host resistance if the resistant phenotype could be selected for, or the susceptible phenotype converted to a more resistant status by vaccination. The purpose of this review is to direct the readers to the literature available on the subject, attempt to summarize recent advances in the field, and outline advancing technologies that hold promise for the identification of resistant and susceptible genotypes, and the manipulation of host innate and acquired immunological resistance mechanisms for safe, sustainable control of arthropod pests of livestock.
2.2 ECONOMIC IMPACT OF PARASITES

Springell (1974) who gave a vivid account of the economic losses caused as a result of tick infestation to cattle industry particularly, due to *Boophilus microplus* indicated the negative role of ticks in production, uncalled for change in blood composition. Let alone the huge wastage of funds involved in affecting suitable control measures.

Kettle and Pearce (1974) while evaluating economic losses by lice reported not only reduced fleece production but also a menacing damage to wool quality of sheep.

Corrier *et al.* (1979) reported that heavy infection by ticks, led to an average loss of body weight of cattle while no alarming weight losses were encountered under lightly infested situations.

Fisher and Wright (1981) proved statistically that the mean cumulative weight gain of control as against the scab mite infested calves bore significant differences.

Cole *et al.* (1984) found that the calves infested with mange mite (*Psoroptes ovis*) gained lowered weight gain/unit of feed consumed than the control, even though the dry matter intake through feed was identical in both cases. The authors also indicated a relatively lower daily weight gain in the affected calves.
2.3 TICKS

Ticks belonging to Arachnids are defined as Arthropods without antennae or mandibles and possess a piercing hypostome with recurred teeth and a pair of a lateral stigmata which do not have sinuous peritremes. All are macroscopic, baby bare or clothed with short hairs and body texture leathery in appearance. Haller’s organ is present.

Ticks are important pests, causes and vectors of diseases. These harm their hosts in varieties of ways by almost all the stages of life history. The larval stages normally have three pairs of legs while nymphal and adult stages have four pairs of legs. Their bites, besides causing annoyance to their hosts also prediscope them for the attacks of blow biting and screw-worm flies. Some workers who have called their attention to tick infestation of livestock are reported.

2.3.1 Tick varieties:

A number of workers have identified ticks affecting livestock with regard to their types, distribution, feeding habits, feeding sites injuries, disease carrier and effect on host health etc. these include:
Rhipicephalus appendiculatus, Rh. truncatum, Rh. pravus and Ixodes cavipalpus, Rh. compositus by Jooste (1966), in Rhodesia.


2.3.2 Distribution:

The ticks are world wide in distribution and almost in all parts of the world the scientist have been drawn their attention on the distribution of ticks.
Such as *Boophilus microplus* is widely distributed in India extending from Northwestern like Uttaranchal and Himanchal Pradesh to eastern state like Bengal, Bihar, Orissa and from tarai of Kumaon hills of the Himalayas to Kanya Kumari in the south and Jammu-Kashmir in extreme north. However, there are variations in the susceptibility between and within the breeds of cattle for example, the European breeds (*Bos taurus*) are more susceptible than the Zebu breeds (*Bos indicus*), Siefert (1971) and Wharton *et al.* (1973).

Warburton (1907) recognized *Amblyomma, Boophilus Haemaphysalis, Hyaloma* and *Ixodes* genera of ticks from Uttar Pradesh, Bihar, Orissa infesting cattle and buffaloes. Warburton (1910) further reported the ixodid ticks from Himanchal Pradesh, Assam, and Kerala. Nuttall (1912, 1913 and 1916) reported a number of species of Ixodid ticks from Almora, Nainital, Deharadun and Udham Singh Nagar, districts of Uttaranchal. Sharif (1928) revised the Indian ticks and dealt with 9 genera namely *Amblyomma, Ixodes, Nosonama, Aponomma Boophilus, Dermacentor, Haemaphysalis, Hyalomma* and *Rhipicephalus*.

In the recent, some of them are Yeruham *et al.* (1982) in Israel; Almeida (1997), in the island of Madeira. They discussed
the localities climatic conditions, attitude, and behaviour of ticks with modifications of their patterns.

AbdulRahim et.al. (1995), studied the prevalence of ectoparasites in Pakistan. Lavender et.al. (1996), report ixodid ticks in the Georgia.

2.3.3 Intensity of tick infestation and effects on host health:

The intensity of tick infestations have been reported by Jagannath et al. (1979) at Bangalore, India; Avatar Singh and Chhabra (1972), in Ludhiyana, Punjab, India; Gill and Gill (1980), at Punjab, India; Drerup Eilker (1980), in Egypt; Drummond et al. (1981) in Barbados; Abdel Rahim et al. (1995) Faisalabad Division, Pakistan; Kamal et al. (1996), in Chittagong, Bangladesh Norval et al. (1997), in Zimbabwe. According to these, the ticks are very important factors affecting the general health and productivity of animals. The infestation affects the growth and reproduction of the livestock. The intensity of tick infestation was found maximum in cattle. The incidence of larvae infestation has been reported to be low as compared to adult stage of ticks.
2.3.4 Seasonal impact of tick infestation:

It has now been experimentally proved that the developmental cycle of ticks is greatly influenced by seasonal and environmental variations. The hot humid weather was found the most favorable for the rapid development of ticks, where as cold weather could prolong the development cycle by 3 to 4 month (Graybill and Lewallen, 1913; Mohler, 1932). Gaisuddin et.al. (1994), observed the seasonal incidence of Ixodid tick in grown pasture of Bangladesh.

A survey of tick infestation (Rabson et al. 1969) showed that high infestation occurred during summer. Cattle, buffaloes and goats harboured more infection of *Hyalomma* and *Boophilus* during summer and the autumn than in spring or winter. *Rhipicephalus* were more prevalent in spring and summer than autumn or winter. Regarding occurrence of purely seasonal ticks species the authors report about the appearance of *Hyalomma detricum*, which occurs during summer only.

Bhat (1974) reported that the infestation of adult ticks begins in June, reaches the peak in July and in August followed by a subsequent decline till November. The larvae first appeared in October and were found in small number till April.
Nymphal infestation become apparent in November and continued till May with a peak during January and February.

Ouhelli et al. (1982) observed significant corelationship between the weight of the engorged females and their eggs production. On the other hand temperature (16°C, 25°C and 35°C) had a significant effect on the oviposition but the relative humidity had no influence.

Tick has its flexibility of adoping to a wide range of atmospheric conditions. It existence at about 320-2240 metre high altitude from sea level in Nilgiri hills of Tamil Nadu, Saxena et al. (1984) and at 243.8 meters high attitude in tarai area of the Himalayas (Das, 1994) has been established. High relative humidity accompanied with small temperature fluctuations allows the tick activity throughout the year (Duhnen, 1988). Milutinovic et. al. (1995) studied on tick fauna and their ecological adaption in Serbia.

Guglielmone et al.(1990), in Salta, northwest Argentina; Bayemi (1991), in Cameroon; Rajendran (2003) in and around Tirupatti and Verissimo et.al. (2002), reported the tick infestation on Zebu cattle and some cross breeds according to their hair coat and Schmidtmann et. al. (1998) also observed
the ecological adaptations in order to search of their suitable hosts. According to these reports there is close association between the seasons and the prevalence of tick infestation.

2.3.5 Ticks as disease carriers:

Ticks as carriers of livestock diseases have been widely studied throughout the world. Zhmaeva et al. (1969); Fallis (1980); Gill and Bhattacharya (1981); Rehman and Roychoudhary (1981), Shastri and Ghafoor (1981); Lal and Soni (1985); Singh et al. (1985); Andrew and Norval (1989); Hoskins (1991) and Das (1994). drew their attention to this aspect. Crause et.al. (1994), reported about the cause of paralysis attack by the tick infestation in Africa and Norval et.al. (1997), studied the effect of ear-tick on the milk production in cattle.

Besides these, the transmission of diseases by the ticks have been reported in America by the Hoskins (1991), Voight et. al. (1993) studied thoroughly the mechanism of transmission of parasites by ticks in vitro medium. El-Kammah et.al. (2001), invested the transmission of blood parasite in livestock through Argasid tick in Egypt, while Ceci et.al. found out the same observation in Italy during 1999, The tick- borne diseses have also been reported from central and Southern Italy by Savini.
Recently, Elkova et al. (2003), reported the tick-borne encephalitis in Slovakia. According to these, the different species of ticks are responsible for the transmission of Babasiases, Theileriasis, Filariasis etc. Kyasanur ferest disease, Anaplasmiasis and Encephalitis etc. in the livestock. The Ixodid ticks have been reported as reservoirs and carriers of mixed infection of these diseases.

2.3.6 Body parts affected and performance of host body by ticks:

Cotton and Watts (1967) reported that the larvae and nymphs of the ticks were found principally in the ear region while the adults thieved mainly on the neck or body of the animals. They further showed that both nymph and adults were apparently more abundant on males than on females through the differences in the intensity of infestation were not significant.

Bhat (1974) reported a higher concentration of adult ticks in the inguinal parts while the immature stages were mostly found in the facial region.

Barnard et al. (1982) working with cattle ticks reported more than 50% infestation to occur on the skin of head and ear in cattle, being principally attached with the inner surface of
ear pinnate, the fore flank, foreleg region, the udder, rear leg region and the neck. About 91% of infestation on female and 94% in males were observed on brisket, foreleg, fore flanks, udder, rear leg, escutcheon and tail, head area on dorsal side of the animals.

2.3.7 Development of Resistance in ticks and also in cattle:

Bianchi et al. (2003), identified to those factors which promote the power of resistance against different acaricides in the Boophilus ticks. Latif et al. (1991), found out the development of immunity in the cattle against the tick parasites Rh. Appendiculatus. Fivaz et al. (1992), studied and compared the development of spontaneous immunity in the crossbreeds against the ticks in the Zimbabwe. Dipeolu et al. (1992), reported the acquired immunity in the cattle after infestation of ticks Rh. Appendiculatus. Jonsson et al (2000) also reported the same in cows against B. microplus.

2.3.8 Tick biology:

Biology of ticks was described by Hoogstral and Kaiser (1900) and observed that complete lifecycle 107 to 146 days. Lounsbury (1905) mentioned the minimum and maximum period of parasitic lifecycle of Boophilus microplus in South
Africa as 35 to 149 days. Graybill (1911) observed that the maximum number of eggs deposited by a female tick. The incubation period of eggs ranged from 19 days to 180 days, the larval period from 5 to 10 days, the nymphal period from 5 to 20 days, and the life of the adult female from 5 to 35 days. The entire lifecycle was completed in 40 days under most favourable conditions. Marko and Bogoroditzkil (1935) reported the lifecycle from egg to adult was completed in about 2 months, oviposition beginning 4 to 9 days after the engorged female dropped and the egg hatches in 28 to 30 days. The larval and nymphal stages approximately lasted 7 to 8 days each and the engorged females were obtained in 7 to 8 days.

Other workers, Gelormini (1940), Boero and Angelo (1946), Hitch Cock (1955), Kohler and Hoffmann (1967), Lombardero and Schiff (1968), Chaudhary (1969), Naithani (1972), Bainbridge (1973), Baht (1979), Achuthan et al. (1980) Gill and Bhattacharya (1981), Sinha et al. (1982), Yeruhan et al. (1989), in Israel; Daniels et al. (1996). The studies about biology of ticks have been undertaken in the laboratories of farms and in all cases the four stages e.g. eggs; larvae, nymphs, and adults with their climatic conditions are involved in the lifecycle of ticks.
2.3.9 Tick control:

Tick being vectors of a number of livestock disease, their control has been attended by Anderson (1964), recommended that the cattle ticks could be reasonably controlled by using DDT (0.5 or 1.0%), gama BHC (0.05 or 0.075%), dieldrin (0.05 or 0.075%) and diazinon (0.06%) when used within an interval of 1 and 2 weeks over a period of 21 months.

Gusev et al. (1964) showed that spraying of shrub land with 2% water emulsion of malathion @ 600 litre/ hectare killed 90% of starved adult ticks (*Ixodes ricinus*). No signs of poisoning were noted in cattle pastures upto 6 weeks in the treated areas commencing the feeding a day after treatment. The acute oral lethal does for rabbit was 250 mg/kg. body weight.

Rangnekar et al. (1971) investigated that spraying of malathion emulsion at 0.75% concentration was effective for control of cows and buffaloes ticks through 1.0% emulsion of this preparation showed relatively higher tick mortality.

Heinze et.al. (1993), reported the efficacy of abamectin against ectoparasites of cattle.
O-Kello-Onen *et al.* (2003), suggested the tick controlling methods on cattle in Uganda.


Betancourt *et al.* (1980), Pandita and Ram (1990) in Mirzapur, U.P. India; Duncan and Monks (1992) in Harare, Zimbabwe; Khan (1995) in India; Gupta *et al.* (1998) and Ravindra *et al.* (2001) in Mathura, India. These scientists reported a number of mechanical and biochemical control measures. Besides these, other control measures have also been recommended.
2.4 USE OF ACARICIDES

Different scientists for the control of ticks affecting livestock have used the different acaricides. Dremova and Smirnova (1970); Koshy et al. (1985); Iwula and Ejezie (1980); Sabins et al. (1984), Singh and Singh (1984); Banerjee and Sangwan (1990) in Haryana. Taylor and Kenny (1990), in northern Ireland, U.K; Pegram et al. (1991), in control province of Zambia; Dumanli (1991), in Turkey; Pangi et al. (1993), in Benin, Africa; Corn et al. (1994) in Guadalevoupe, French West Indies have worked with variety of acaricides and reported their efficiency with regard to different situations. Recently, some have come out with insecticidal ear tags, which may find an, effective use by livestock owners.

2.5 MITES

Mites are worldwide in distribution and parasites on almost all kinds of animals and some plants. These are major ecto-parasites on domestic and wild animals and they harm their hosts in varieties of methods, which are collectively called Mange or scab (Psoroptic, Sarcoptic, Chorioptic and demodectic etc.) Besides these, they also produce dermatitis other skin
diseases and scaly face etc. Hutyra and Marek (1949). Agosti (1992), described mites as the cause of mange in animals.

The mites are a group of arthropods, which apart from the parasitic species has been largely neglected but this being rectified with a publication of several comprehensive texts (Persson et al., 1981). Acarines are widely distributed throughout the world being mainly terrestrial (Neog, et al. 1995). Akers, A.S. et. al. (1996) reported the first record of cattle itchmite, Psorobia bos in the Palaeorctic region.

2.5.1 Varieties of mite:

Dutoit and his coworkers (1932 have been reported the different species of mites causing mange in livestock as under *Sarcoptes scabiei* var. *caprae* by. Abu Shamra et al. (1981), *Psoroptes cuniculi* and *Raillielia manfredi* from the ears of goats by Cook (1981).

Chakrabarti and Chauduri (1984) from West Bengal. *Sarcoptes scabiei*, Demodex mites. Baker et al. (1996) reported the *Psorobia bos* on the cattle in Palearctic region. This is also the first record of genus *P. sorobia* in the British Isles.
Venktessan et al. (1979) reported the occurrence of mite species Demodex Caprae, in the internal parts of goats.

Nemeseri (1961) demodecosis in cattle, Zumpt (1961), Lebel et al. (1973) about Demodex caprae; Demodex cafferi from the African buffalo by Nutting et al. (1979); S. Scabiei (Prasad, 1974).


2.6 MANGE IN CATTLE

The scabies or mange must be based on recovery of mites from the affected hosts to the half animals, a skin scraping is made of the infected area, caused by the different genera, such as sorcoptes and Psoroptes. Sorcoptic mange is common in Britain and America and is the cause of dairyman's itch. It is usually found on the head and neck, but may occur on any part of body. Bulls are particularly liable to this form of mange.
There is a huge literature on mange or scab affecting man and other domesticated animals. Dutoit and his coworkers (1932) studied mange in cows. Abu-Samra et al. (1981), mange in animals in the Sudan; Cook (1981) on the ear mite in Australia. Prasad (1984); Sheick-Omar et al. (1984) and Kambarage (1992) have reported mange in cattle.

Warnick et al. (2002), observed the udder cleft dermatitis and sarcoptic mange in a dairy herd. Beck, W. (2005) examined epidemiological symptoms and circumstances of bovine Chorioptic mange in Germany. Kumar et al. (1994), observed the associated infestation of mite and tick varities found in soil profiles, in India and Losson, B observed the mange and pediculosis in cattle.

2.6.1 **Incidence and pathogenicity of mange mites in cattle:**

The over all incidence of mange in cattle are by three genera of mites such as Sarcoptes, Psoroptes and Chorioptes. The seasonal incidence of mange in cow and their calves was highest in Post-monsoon and winter, respectively and lowest effect of mange mites in the season of summer months. The similar observation was also made in the section of skin by
hosts with sarcoptic mange along with hyperkeratosis and parakeratosis and acanthosis by Neog et al. (1995).

In limited studies undertaken on the incidence of mange mite in Assam, Neog et al. (1992) recorded the incidence in the goats. However information on the occurrence of different mange mite in other domestic animals is very scanty. The incidence of different species of mange mite in the cattle and buffalo that was studied by Gordon et al. (1943). Hutyra and Morck (1949). Basu et al. (1953), Sinha (1966), Avtar Singh and R.C. Chhabra (1973) from Punjab, reported *Sarcoptes scabiei* in buffaloes, cattle and dogs by Abu-Samra (1981); Cook (1981); Uppal and Sharma (1981). Thomson and Mackenzie (1982), Chakrabarti and Chauduri (1984). Neog et al. (1996); Sharma et al. (1997); Baruah, *et al.* (2001), were examined for the presence of oribatid mites in and around Guwahati, Assam. In all, 8498 oribatid mites were recovered. The average recovery of mites was 89.61. The highest average recovery of mites of 329.62 was recorded in May and the lowest recovery of 11.62 in the month of August. The effect of temperature, soil, water content and rainfall on the incidence of oribatid mite population was studied.
2.6.2 Mites control:

The attempts to control the infection of mange mite have been made by a number of workers, such as investigation by Saxena and Deo (1965) revealed that 40% nicotin sulphate (0.2% spray solution) yielded 85.4% control, while lindane in concentration of 0.02% (25% spray suspension) was effective to the extent of 92% against oribatid mite on Pasture. DDT (70%) in spray suspension of 0.2 gave 88.8% efficiency against infestation on pasture. Out of these three acaricides lindane was found to be the most efficacious.

Shrivastava and Khan (1973) investigated that dieldrin (0.1 to 0.2%), asuntal (0.25% to 0.5%), neguvon (0.15%) and lindane (0.05%) were effective for control of sarcoptic mange mite in cows whereas 0.15% and 0.1% butox were comparatively less effective. The authors further showed that dieldrin and lindane at the above specified concentrations were effective for the treatment of buffaloes and cows from mixed infestations of Sorcoptes and Psoroptes.

Ram et al. (1980) reported that the acaricides were sprayed thrice/week at weekly intervals for the control of
sorcoptic mange mite carbaryl (0.5%), DDT (0.025%); fenitrothion (0.5%) and BHC (0.25%). All infested cattle treated with carbaryl or fenitrothion were free after BHC or DDT treatment. The chlorinated hydrocarbons were used at low concentrations to avoid toxic effect, but there poor efficiency might possibly have been due to insecticide resistance caused by the previous treatments.

Reddy (1974), studied on the evaluation of the efficacy of certain agents, the gamma BHC at concentration ranging form 0.01% to 0.03% in undoubtedly one of the most efficient mite Killers. The organo-phosphorus compounds, diazinon and fenchlorphos are also effective. For the best results they should be applied by dipping or as saturating sprays, and for the sorcoptic mange particularly, two or more treatment may be necessary at intervals of 10 to 14 days.

Recently some other efficient acaricides have been applied to control the scabies on different domestic animals throughout the world, by Yathiraj et al. (1990), in Banglore India; Toxaphane on cattle by Chhabra and Kapuma (1991), in south provinces Zambia.