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A Review on Ixodid Ticks (Acari: Ixodidae) Infesting Bovine

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Abstract: Ethiopia has the largest livestock population in Africa, but the contribution for the economic aspect of the country is still the lowest and the diseases can be considered as a major constrain. Ticks are the most important ectoparasites of livestock in tropical and sub-tropical areas. Ethiopia is not exceptional and ticks are responsible for severe economic losses both through the direct effects of blood sucking and indirectly as vectors of pathogens and toxins. Feeding by large numbers of ticks causes reduction in live weight gain and anaemia among domestic animals, while tick bites also reduce the quality of hides. However, the major losses caused by ticks are due to the ability to transmit protozoan, rickettsial and viral diseases of livestock, which are of great economic importance world-wide. The main tick genera found in bovine of Ethiopia are *Amblyomma*, *Hyalomma*, *Rhipicephalus*, *Haemaphysalis* and *Rhipicephalus* (*Boophilus*). Various breeds of cattle differ in their response to tick infestations. *Bos indicus* pure breeds and crossbreeds are reported to be more innately resistant than *Bos taurus* breeds. The conventional method of controlling tick infestations in Ethiopia is application of acaricide, either by hand spraying or hand dressing. Therefore, to minimize tick adverse effect appropriate and timely strategic control measures are crucial.

Key words: Bovine · Ectoparasites · Ethiopia · Ixodidae · Ticks

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country [1]. In Ethiopia, livestock production remains crucial and represents a major asset among resource-poor small holder farmers by providing milk, meat, skin, manure and traction force [2]. The contribution of livestock to the national economy particularly with regard to foreign currency earnings is through exploration of live animal, meat and skin and hides [3].

Poor health and productivity of animal due to disease has considerably become the major stumbling block to the potential of livestock industry [4]. Now a day parasitism represents a major obstacle to development and utilization of animal resource. In Ethiopia, ectoparasites in ruminant cause serious economic losses to small holder farmers, the tanning industry and country as a while through mortality of animals, decreased production, downgrading and rejection of skin and hide [5]. From the ectoparasites, ticks are ranked as the most economically important of livestock in tropics including sub-Saharan Africa [6].

Ticks are small, wingless ectoparasitic arachinid arthropods that are cosmopolitan and prevalent in warmer climates [7]. Ticks cause substantial losses in cattle production, in terms of diseases, reduced productivity and fertility and often death and are economically the most important ectoparasites of cattle [8]. Huruma *et al*. [9] indicates that different ticks have different predilection sites on the host's body. Ticks suck blood; damage hides and skins introduce toxins and predispose cattle to myiasis and dermatophilosis [10, 11]. Furthermore, they reduce body weight gains and milk yield, in addition to creating sites for secondary invasion by pathogenic organisms [11]. More significantly, ticks transmit diseases from infected cattle to healthy ones. Ticks transmit a greater variety of pathogenic micro-organisms than any other arthropod vector group and are among the most important vectors of diseases affecting animals [10].

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According to Walker *et al.* [12] ticks which are considered to be most important to health of domestic animal in Africa comprise about seven genera. Among these genera, the main tick genera found in Ethiopia include *Ambylomma*, sub genus *Rhipicephalus* (*Boophilus*), *Haemaphysalis*, *Hyalomma* and *Rhipicephalus.* The genus *Ambylomma* and *Rhipicephalus* are predominating in many parts of country, *Hyalomma* and sub genus *Rhipicephalus* (*Boophilus*) also have significant role [13]. Due to economic and veterinary importance of ticks, their control and transmission of tick borne diseases remain challenge for the cattle industry of the world and it is a priority for many countries in tropical and subtropical regions [14]. In Ethiopia, there are about 47 species of ticks found on livestock and most of them have importance as vector and disease causing agent and also have damaging effect on skin and hide production [15]. Therefore, the objective of this paper is to review tick biology, the taxonomy, pathogenic effects and methods for the control of ticks in Ethiopia.

General Description of Tick

Taxonomy of Tick: Ticks are classified under the phylum (Arthropoda), class Arachnida, Order Acarina, suborder Ixodida, families Ixodidae and Argasidae which are distributed worldwide. Ticks are members of the same phylum (Arthropoda) of the animal kingdom as insects, but are indifferent classes (class Insecta includes flies, fleas and lice, but class Arachinida includes mites and ticks). The subphylum Chelicerata includes the class Arachnida, which again contains several subclasses [16]. The subclass Acari (syn. Acaria, Acarina, Acarida) includes ticks. There are three well established families of ticks, the Ixodidae (hard ticks), Nuttaliellidae and Argasidae (has hard scutum, male and female easy distinguished, collects on the host, each parasitic stages feed only one times, sexual dimorphismis marked, can mate on the host except *Ixodes* spp, mouth parts are visible and has one nymphal stage) or soft ticks (noscutum, male and female note as distinguished, mostly not collected on the host,) nymphs and adults feed many times, sexual dimorphism not marked, has several nymphal stage active throughout the year and has long life time. Family Ixodidae (hard ticks) contains (702) specie (14) genera Argasidae (193 spp. The number of genera is controversial and currently under discussion) and Nuttalliellidae (one species) [17]. These include *Amblyomma* (102 species), *Boophilus* (5 species) *Dermacentor* (30 species) *Haemaphysalis* (155 species) *Hyalomma* (30 species), *Ixodes* (254 species) and *Rhipicephalus* (70 species) [18].

The Ixodidae (hard ticks) and Argasidae (soft ticks) both have sharing certain basic properities; they differed in many structures, behavioral, physiological, feeding and reproduction pattern. Ticks that are considered to be most important to domestic animals' health in Africa comprise about seven genera and forty species. Among these tick genera, the main ticks found in Ethiopia are *Ambylomma* (40%), *Boophillus* (21%), *Heamaphysalis* (0.5%), *Haylomma* (1.5%) and *Rhipicephalus* (37%), *A. varigatum* and *B. decoloratus* are most important and widely distributed in Ethiopia [16].

Morphology of Ixodidae

Family Ixodidae (Hard Ticks): It varies in shape and species. Ticks belong to the super order of Acarina, which have certain characteristics that distinguish them from other arachnids such as spiders. Ticks have a rounded body, without a clear boundary between the anterior and posterior parts. The body is divided into a capitulum (gnathosoma) and the body (idiosoma). Ticks have six pairs of appendages including the chelicerae, pedipalps and four pairs of locomotors appendages [19]. Tick morphology consists of two primary regions, the mouth parts (capitulum) and the body (idiosoma). The mouth parts (capitulum) have three specialized structures called palps, chelicerae and a hypostome that are attached to a base called the basis capituli. These structures function together and allow ticks to penetrate the hosts kin and extract a blood meal from the tissues. The body (idiosoma*)* of ticks is typically not hardened to a great extent [16].

In hard ticks, most of the exterior cuticle is soft and has many internal folds that look like groove son the surface of the body. The uniform, rectangular folds located on the rounded posterior end of hard ticks are called festoons [20]. Male and female hard ticks can be distinguished from one another by the size of the scutum. In males, the scutum is large and covers the entire upper surface of the body, whereas in females the scutum is much smaller and covers less than half of the upper body surface, thus allowing the body to greatly expand during engorgement with host blood. One pair of eyes is normally located near the front corners of the scutum in hard ticks [21].

Colored patterns occur on some ticks as a pigment (enamel) in the outer body wall. It occurs on the scutum, conscutum or legs. The presence of pigment is known as enameling or ornamentation and such ticks may be called ornate. The color is usually ivory white but in *Amblyomma* ticks it is often orange and green. However, this color has limited use for identification of ticks. Even with the colorful *Amblyomma* ticks it is the pattern made by the light colored enamel against the dark uncolored body wall that is more important than the actual color of the enamel [16].

Developmental Strategies of Tick

Mating: Adult soft ticks mate while off the host, but adult hard ticks mating takes place on the host species [22], except with *Ixodes* where it may also occur when the ticks are still on the vegetation. Blood feeding is required by males for their spermto mature, but they do not engorge as much as females and immature stages do. Males take small quantities of blood as they wait for females to attach nearby where they are able to detect them [22]. They transfer a sac of sperm (spermatheca) into the female ticks. The females mate only once, before they are ready to engorge fully with blood. When they finally engorge they detach from the host and have enough sperm stored to fertilize all their eggs. Female hard ticks lay many eggs (2, 000 to 20, 000) in a single batch.

Life Cycle: Ticks are among the most significant blood-sucking arthropods and distributed worldwide. They transmit various pathogens that can cause disease and death in cattle. Ticks have several morphologic features and physiologic mechanisms that facilitate host selection, ingestion of vertebrate blood, mating, survival and reproduction. Although the natural history of ticks varies considerably among species, these arthropods are well-adapted to survive in tropical, temperate and even subarctic habitats. Most ticks require three different hosts to complete one full cycle. These three-host ticks detach on completion of feeding, drop from the host, molt and wait for another host. The life cycle of tick involves according to feeding habitat and characteristic number of host individuals [23].

In the hard ticks mating takes place on the host, except with *Ixodes* where it may also occur when the ticks are still on the vegetation. Male ticks remain on the host and will attempt to mate with many females whereas they are feeding. The life cycle of ticks (both Ixodid and Argasids) undergo four stages in their development of eggs, 6-legged larva, 8-legged nymph and adult. According to the numbers of hosts, Ixodid ticks are classified as one-host ticks, two-host tick and three-host ticks and Argasids classified as multi-host ticks. In one-host ticks, all the parasitic stages (larva, nymph and adult) are on the same hosts; in two-host ticks, larva attach to one host, feed and molt to nymph stage and engorged, after which they detach and molt on the ground to adult; and in three-host ticks, the larva, nymph and adult attach to different hosts and all detach from the host after engorging and molt on the ground. In multi-host ticks (Argasids), a large number of hosts are involved and it is common to have five molts, each completed after engorging and detaching from the hosts [23].

The commonest life cycle of one host ticks of all the three instars (larva, nymph and adults) feed on one host to complete their life cycles. Male and female copulate on host during feeding process [16]. The engorged female, then drop to the ground to lay eggs species [22]. Eggs are laid as one batch of large quantity and the female after wards die a natural physiological death. Such these types are the species of *Boophilus* [16].

The two-host life cycle is ticks attach as larvae and complete development through the nymphal stage but feed on the same individual host. The replete nymph then drops from the host, molts to the adult stage and later seeks a second host to its development like a few species in the genera *Hyalomma* and *Rhipicephalus* are experience the two-host lifecycle [24].

All the three host ticks larva emerges from the egg deposited on the ground, look for a host, feed on it for 3-7 days, drop off and molts after 3-4 weeks on the ground [20]. The nymph must then find another host, get on that host, attach to that host, engorge on that host's blood, drop from that host and molt to the adult stage [21] on the ground after 2-8 weeks. Then the adult ticks look for a third host to feed on and for copulation with male, which takes 1-3 weeks. Finally it drops off and completes that cycle with oviposition on the ground to continue another cycle for example: all species of *Amblyomma* [16].

Epidemiology of Tick

Host Relationship: Some ticks live in open environments and crawl onto vegetation to wait for their hosts to pass. This is a type of ambush and the behavior of waiting on vegetation of is called questing. Thus, in genera such as *Rhipicephalus*, *Haemaphysalis* and *Ixodes* the larvae, nymphs and adults will quest on vegetation. The tick grabs onto the host using their front legs and crawl over the skin to find a suitable place to attach and feed. Adult tick of genera *Ambylomma* and *Hyalomma* are active hunters, they run across the ground after nearby hosts [25]. They seek out places on the hosts where they are protected and have favorable conditions for their different ticks have different predilection sites on the host's body [16]. The favorable predilection sites for *B. decoloratus* was the lateral and ventral side of the animal; *A. variegatum,* teat and scrotum; *A. coherence* udder and *H. truncatum,* scrotum and brisket and *H. mrufipes* udder and scrotum, *Rh .e. evertsi* under tail and anus and *Rh. preaxtatus* anus and under tail [26]. Depending on the tick, site preference on the host depends on the accessibility for attachment, to get blood and protection to overcome the environment damage that inhibits its existence and grooming activity of the host. Tick location on the host is lined to the possibility of penetration by hypostome. Genera with short hypostome for example *Rhipicephalus*, *Dermacentor* and *Haemaphysalis* species usually attach to hairless area such as under tail and vulval areas were developed [9].

Distribution of Ticks in Ethiopia: In Ethiopia, the distribution and abundance of tick species infesting domestic ruminants is vary greatly across different from one place to another place (Table 1). The distribution and seasonal dynamics of the predominant ixodid tick species in Ethiopia is an notated below. *Amblyomma variegatum* occurs in areas with a wide variety of climates ranging from highland, savannah through to lowlands [16] but its abundance varies greatly across different agro-climatic zones in Ethiopia. It is widespread and abundant tick parasitizing cattle in the central highlands of Ethiopia as well as in the highland areas of the eastern parts of Ethiopia [27]. However, its abundance was much lower in tropical woodland and thorn-bush vegetation habitats in the rift valley and absent in the arid south-eastern areas with annual rainfall ranging from 400-500 mm in Ethiopia [28]. The tick requires moisture and warmth forits survival and the activity of adult ticks commences during the beginning of spring rain in Ethiopia. *A. variegatum* is considered as the most prevalent and predominant tick species in higher rainfall areas in Ethiopia [29].

Amblyomma gemma adults feed on domestic animals such as cattle and camels, although large herbivores such as giraffes and buffaloes are the preferred hosts of this tick species. *A. gemma* has been recorded from areas with climates ranging from highland through steppe to desert [16].*A. gemma* is mainly distributed in eastern Ethiopia, northern, southern and southern Somalia. It is a xerophilic species, prefers woodland, bushland, wooded and bushy grassland in arid and semi-arid areas. This tick mainly abundant in areas with altitude of 500-1750 mm and 350-750 mm rainfall. *A. gemma* and *Rh. pulchellus* are confined to semi-arid areas and lowland tick densities are usually greater than those in the highlands [27]. *A. gemma* is an important tick on cattle and camels in eastern and south-eastern parts of Ethiopia particularly in Afar, Somalia, Harar and eastern Tigray, Amhara and South Nation Nationalities and Regional State (SNNPR). In Ethiopia, this tick is most prevalent during the rainy season and is generally restricted to the semi-arid lowlands in the rift valley and in eastern areas receiving 100-800 mm annual rainfall [27].

Rhipicephalus (*Boophilus*) *decoloratus* is also known as the blue tick, because of the color of the engorged females. Cattle are the main host. It occurs in regions with savannah and temperate climates, typically in grasslands and wooded areas used as cattle pasture [16]. In Ethiopia, *Rh.(Bo.) decoloratus* widely distributed tick species in different agroecological and seasons of the country. It is the commonest and most widespread tick in the country; collected in all administrative regions except in the Afar region. Its distribution pattern is similar to that of *A. variegatum*. In previous records, *Rh*. *Decoloratus* was collected between 1200-2400 m altitude and at 1000-2400 mm rainfall in both rainfall modes and was predominate in broad-leaved and coniferous forest areas [27].

Rhipicephalus pulchellus is also known as the zebra tick due to a pattern of stripes of white enamel on a dark brown background over their entire conscutum and its use of zebras as a favorite host. They attaches in large numbers on cattle. *Rh. pulchellus* adults appear to be most active during the rainy season. *Rh. pulchellus* is a tick of savannah, steppe and desert climatic regions. In Ethiopia, *Rh.pulchellus* has been reported as the most predominant tick species on camels in eastern Ethiopia, on small ruminants in eastern part of Ethiopia and on cattle in Borana zone in Oromia region [30-32].

Rhipicephalus evertsi is known as the red-legged tick due to their uniform orange colored legs and thus it is easy to differentiate from all other *Rhipicephalus species*. Its distribution includes desert, steppe, savannah and temperate climatic regions [16]. The native distribution of *Rh. evertsi* in Ethiopia seems to be connected with middle height dry savannas and steppes, in association with zebra and ruminant and it is widely distributed throughout Ethiopia. This tick species shows no apparent preference for particular altitude, rainfall zone or seasons. These ticks are active mainly during the summer but are present throughout the year in warm regions [27].

Hyalomma truncatum is also known as the shiny *Hyalomma* because of the smooth surface of the male ticks. *H. truncatum* is adapted to dry habitats and is commonest in desert, steppe and savannah climatic regions, but is also recorded from highland climates [16]. In Ethiopia, it is present in different agro-climatic zones expect in the South-western part of the country [27]. Previous investigator in Ethiopia collected *H. truncatum* as one of the important tick species in central Oromia [33].

Table 1: Distribution of predominant tick species of cattle in different part of Ethiopia

Tick species	Prevalence (%)	Study Area	Author
A. variegatum	22.9	Around Sebeta town Oromia	[9]
A. gemma	3.48	Saylem, SNNPR	[34]
	20.1	West Aris zone	[35]
A. hebarium	14.88	Saylem, SNNPR	[34]
H. truncatum	3.25	Chilga, northwest Ethiopia	[36]
Rh (B) decoloratus	32.3	Babile, eastern Ethiopia	[37]
	51.6	West aris zone	[35]
H. trancatum	8.56	Around Sebeta town Oromia	[9]
	2.4	Guba–koricha West Hararghe	[38]
	4.44	Saylem, Masha SNNPR	[34]
R. e. evertsi	53.4	Around Sebeta town Oromia	[9]
R. punchellus	16.0	Fafem, Awubera Somalia Regional State	[39]

Tick Feeding Adaption and Survival: Most ticks have characteristics species of hosts to which they are adapted. These hosts' single species but more commonly are a group of similar species. For instance all the *Boophilus* species are highly adapted to feed on cattle, but some *Boophilus* may survive by feeding on sheep. The survival of a population of ticks depends on the presence of hosts suitable for reproduction by variety than the hosts on which larvae and nymphs of three-host tick can survive. They are also more limited than those on which adults may attempt to feed but not necessarily survive. To use information of tick hosts identification it is important to realize that a species of tick has a characteristics range of host species and it may be found much less commonly on many other kinds of hosts species. For example, carnivorous mammals may be infested temporarily with ticks which have transferred from their herbivorous prey [40].

Some ticks live in open environment and crawl onto vegetation to wait for hosts to pass. This is type of ambition and the behavior of waiting on vegetation is called questing. Thus in genera such as *Rhipicephalus*, *Haemaphysalis* and *Ixodes* the larvae, nymphs and adults will quest on vegetation. The grabs onto the using their front legs and crawl over the skin to find a suitable place to attach and feed. Adult tick of genera *Amblyomma* and *Hyalomma* are active hunters, they run across the ground after nearby hosts' [23].

Tick attachment site specificity is one of the populations that operate through the restriction of tick species to certain parts of the host body. The tick grabs on the hosts using their front legs and then crawls over the skin to find a suitable place to attach and feed [16]. They seek out places on the hosts where they are protected and have favorable condition for their development and shows that different ticks have different site on host's body. The predilection sits for *Amblyomma* were brisket udder, scrotum, dewlap; *Hyalomma* scrotum, udder, brisket; *Rh. (Boophilus*) dewlap, udder, sternum; *Rhipicephalus* head, tail [37, 38].

Deepening on the tick, site preference on the host depends on the accessibility for attachment, to get blood and protection to overcome the environment damage that inhibits its existence and grooming activity of the host. Tick location on the host is lined to the possibility of penetration by hypostome. Genera with short hypostome like *Rhipicephalus*, *Dermacentor* and *Haemaphysalis* usually attach to hairless area such as udder, tail and anovulval area [41].

Other ticks, such us nearly all argasid ticks and many *Ixodes* species spend their life cycle in the nest or shelter of their hosts. Some ticks are adapted to living in the housing of domestic animals. Attractants released by hosts that stimulate questing by tick include carbon dioxide and ammonia. Questing larvae of *Rh. appendiculatus*, the larvae cluster to conserve moisture and they are high on a grass stem for best contact with hosts and become active as soon as they sense a host approaching. Questing female of *Ixodesricinus* is activated by sensing a host and holds its front legs out for sensing the host and grasping onto the host with paired claws on each leg. The downward facing posture is typical. *Amblyomma* adults hunt for their hosts over short distances by running to them over the ground. Questing *H. anatolicum* female is on a mass of cobwebs on the housing of its host and will actively crawl from its resting site to its host, the front legs are held up to sense and grasp the host [42].

Pathogenic Effect of Tick on Livestock

Direct Effect: Feeding by large numbers of ticks causes reduction live weight, unrest, tick worry irritation, severe dermatitis, anemia and serious physical damages, while the direct injury also reduce the quality of hides due to tick bites, loss of blood due to the feeding of ticks [43]. The damage is manifested as hide damage, damage to udders, teats and scrotum, myiasis due to infestation of damaged sites by maggots and secondary microbial infection. Ticks bites can directly debilitating to domestic animals, causing inflammation and hypersensitivity. These parasites generate direct effects in cattle in terms of milk production and reduce weight gain. This diminish in market value of dairy, flesh, skins and hides for the manufacture of leather and other livestock products and death of animals is a great economic threat to the livestock and allied industries [44]. Estimate, one million United State Dollar (USD) is lost annually only through rejection of downgraded hides and skins attributed to tick damage in Ethiopia [45].

Indirect Effect: In addition to sucking large volume of blood, ticks also act as reservoirs and vectors for a wide range of human and animal pathogens worldwide and thus inject pathogens such as viruses, bacteria, protozoa and toxins in to their hosts. Some of the most important tick-borne diseases are east coast fever (ECF), Redwater, anaplasmosis and heartwater. Many other fatal and benign babesiosis and theileriosis are also transmitted by various tick species. The estimated annual global costs associated with ticks and tick-transmitted pathogens in cattle amounted to between USD 13.9 billion and 18.7 billion [46]. An annual cost of 3 million Birr (USD 1.5 million) to purchase Acaricidees was estimated in 1989. When other losses such as deaths, reduced growth rate and reduced milk production are added, economic losses due to ticks and tick-borne diseases are highly significant.

Vector of Diseases: The main diseases transmitted by ticks to livestock are anaplasmosis (ruminants), babesiosis (ruminants, horses and dogs), theileriosis (ruminants, horses) and cowdriosis (ruminants). Ehrlichiosis in ruminants and dogs is also important in certain tropical and subtropical regions. Endemic stability can often be achieved, especially in indigenous livestock and even East Coast fever may cause no more than slightly increased calf mortality in local zebu in fully endemic areas. *A. variegatum* (vector of *C. ruminantiumand T. mutans*) and *Boophilus* species (vector of *A. marginale* and *B. bigemina*) are the most widespread ticks in Ethiopia *R. e. evertsi* is also known to occur across different ecological zones of the country serving as a vector for *B. bigemina* in cattle [47]. Estimates of economic losses due to ticks and tick-borne diseases are often little more than educated guesses. Any form of control in local resistant livestock is not always cost-effective, whereas intensive and expensive control measures are often required for valuable exotic breeds [23].

Control of Ticks

Chemical Control Method: The chemical acaricidees are the main chemical compounds of tick defense in both humans and domestic animals. Chemical acaricides are commercially available for acaricideal or repellent effects on insects and herbivores. There are wide range of acaricides, including arsenical, chlorinated hydrocarbons, amidines, synthetic pyrethroids, organophosphates and carbamates [48]. The performance of acaricide in control of ticks depends on application quality and quantity of active ingredient deposited on cattle.

Use of arsenic was the first effective method for controlling ticks and tick-borne diseases in many parts of the world [44]. It was cheapest and most effective and used in the form of water-soluble compounds like sodium arsenite and it was successfully used to eradicate *Boophilus* ticks from the southern UnitedStates. Unfortunately, arsenic as a very short residual effect (less than one to two days) and in most areas of the world it is restricted by *Boophilus* ticks [43].

Chlorinated hydrocarbons were arsenics chemicalas many ticks' species developed resistance [49]. These acaricidees are very persistent and extensively used throughout the world for controlling ticks (benzene hexachloridetoxaophene) [43], then because of their high toxicity and long lifespan, withdrawn from the market [50].

Chlorinated hydrocarbons were replaced by organophosphates since 1950, because they already develop resistance [51]. Organophosphates are esters of phosphoric acid and have a wide range of activities against ticks at very low concentration in companion and livestock animals. However, their residual effectiveness is usually shorter than that of chlorinated hydrocarbons and the risk of causing acute toxicity in livestock is greater [43]. Resistance in ticks first recognized since 1963 and several tick species are now resistant to organophosphates [52]. Carbamates are esters of carbamic acids and closely resemble the organophosphates [50]; they are a little more toxic than the organophosphates for mammals and are much more expensive.

Various methods of application such as dipping, spraying, ear tagging or pour on used to apply chemicals to control cattle ticks. As method of application, dipping is immersing animals in a dipping tube or dipping vats containing solution of chemicals. Spray methods is the application of fluid Acaricides to animals using spraying equipment. Spray method successfully practiced for the spraying equipment is highly portable and only small amounts of Acaricides need to mix for a single application. However, spraying is generally less efficient in controlling ticks than immersion in a dipping vat [43].

The inner parts of the ear, under part of the tail, the areas between the teat and the legs in cattle with large udder are especially escape treatment during spray and dipping method Acaricides may be applied to these sites by hand termed hand dressing or spot treatment. The application of insecticides with aerosols and in oils, smears and dusts by hand to limited body areas is time-consuming and laborious.

Ecological Control Method: Information on the ecology of different instars is used for habitat and host linked treatments. Tick control in the habitat and vegetation requires modification of the plant cover by removal of vegetation that shelters ticks. Vegetation is periodically removed by burning, but spontaneous or induced fires have little direct effect on ticks since they occur in the season when adults are not active. Annual dry-season fires are widespread in semiarid regions; the value of these fires is very controversial, as they influence not only the availability of an important source of grazing during long harsh dry seasons, but may also diminish the abundance of ticks and vermin such as rats. The influence of burns on tick abundance varies markedly with the time of year, intensity of burn and the tick species present [53].

Biological Control Method: Entomopathogens are group of organisms that Aggress ticks and insects. It can be macro-or microorganisms (nematodes or fungus) that affect arthropods [54]. The biological agents, which potentially include predators like rodents, birds, ants, spiders, lizards and beetles as well as Parasitoids (destroy the host: the eggs in the engorged ticks and larvae eats the tick and emerges as adult to attack another tick) and parasites (nematodes and fungus) are attacks soil living stages of the ticks are effective and depending on the conditions, these predators can consume a large number of ticks [23]. Now a day, having such effective importance the development of a biological tick control methods has been neglected as compared to the control of plant pests or dipterous insects harmful to men and animals [54]. Until this is known, it is not possible to recommend such alternatives to producers for adoption and practical use in the field in Ethiopia.

Botanical Control Method: Acaricidees of botanical origin have shown a wide range of biological activities, including toxicity, repellence, anti-feed and growth regulatory effects up on their action [55]. The insecticidal and Acaricideal properties of plant extracts have been studied since 1950s. With the emergence of chemo-resistance to chemical insecticides, the market of chemical products is under crisis whereas Acaricideal or repellent plant extracts has increased in several countries [56].

Some plant families have toxic or repellent effects on ticks when used in the controlled setting of a laboratory test. In field conditions, the Acaricideal activity of biological/botanical pesticides is influenced by additional factors, with breed of target animals, tick species and climatic conditions including UV radiation being the most important. Field studies are available in a much smaller number compared to laboratory tests, due to this fact only plant extracts with good results in the lab are generally costly and used in field experiments too [56].

Tick Vaccine: The development of the first effective vaccine against *Rh*. (*B). microplus* was a great advance in the fight against a serious pest that interferes with world food production. The two commercially available vaccines (Tick GARDH Vechst, Australiaand GavacTM, Heber Biotec, Cuba) are now on the market in a limited number of countries. Both vaccines are based on hidden antigens from the gut of the tick that once inoculated into cattle, induce the production of antibodies which, when ingested by the tick, result in damage to the gut, slightly reduced survival, reduced egg production and reduced hatchability of eggs [57].

Consequently, tick populations decline with time, although there is little direct mortality effect on ticks. Tick vaccines reduce the number of engorging female ticks, their weight and reproductive capacity, meaning that the greatest vaccination effect is seen as a reduced larval infestation in the subsequent generation [57].

Breeding Cattle for Tick Resistance: For long times, acquired resistance toixodid a tick has been recognized as a possible biological control method. Such resistance, acquired after repeated infestations by ticks, is immunologically mediated. Acquired immunity is expressed by a reduction in the number of ticks which attach to the host, reduced engorgement weights and reduced egg and larval production resulting in significantly reduced tick populations [22]. Although some of the observed variation in natural tick resistance is related to environmental factors and significant component of variation in natural disease resistance appears to be genetic origin. Different studies have been conducted on genetic determination of tick resistance. Tick resistance has been shown to be heritable reported a heritability estimate of 34% for tick resistance, indicating that genetic improvement through selection should be effective. Resistance of cattle to tick infestation was reported to consist of innate and acquired components.

Stock Breeding and Pasture Management: Indigenous cattle breeds to Africa, typically Bosindicus or zebu have a good heritableability to acquire natural resistance to the feeding of ticks. This characteristic can be used in breeding programmed to produce crosses with more productive exotic cattle of the Bostaurus type which will give good resistance to ticks and good production [23].

Resistance of Tick to Acaricide: There are wide range of Acaricidees, including arsenical, chlorinated hydrocarbons, amidines, synthetic pyrethroids and organophosphates [48]. In Ethiopia, different Acaricidees (organchlorines, organophosphates, carbamates, amidinesor synthetic pyrethroids) used to control ticks. Due to wide application of organochlorines and organophosphates, ticks developed resistance [28].

Chemical Acaricidees are the main anti-tick defense substances in domestic animals, but the main concern now is the development of Acaricide resistance in some species of the cattle ticks [57].

CONCLUSIONS AND RECOMMENDATIONS

Ticks are obligate blood feeding ectoparasites of vertebrates and induce huge production loss in livestock industry and creating serious public health problems in the world. The main tick genera found in Ethiopia are *Amblyomma*, *Boophilus*, *Haemaphysalis*, *Hyalomma* and *Rhipicephalus*. Heavy infestations by different tick species suppress the immunity of cattle and also damage teats and reduce productivity of animals and there are direct effects associated with tick infestation that leads to tick worry, anorexia and anemia. These all are the impacts of tick infestation so, to minimize tick impact appropriate and timely strategic control measures are crucial. The conventional method of controlling tick infestations in Ethiopia is application of acaricide, either by hand spraying, by hand dressing. The availability of vaccine is very small. The ability to induce an effective, sustained immunological response is crucial but needs improvement. Problems of acaricide resistance, chemical residues in food and the environment and the unsuitability of tick resistant cattle for all production systems make the current situation unsatisfactory and require the development of absolute control through effective vaccine. Therefore, in line with the above conclusions; the following recommendations are forwarded:

- The government should monitor the use of potentially dangerous chemicals and conserve foreign exchange.
- Research should be conducted on tick species and their epidemiology for the continuous understanding of improved control strategies
- Awareness should be given to animal breeder on problem of tick and different control method.

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