Evaluation of organic ectoparasiticide “GochidGo” against cattle tick infestation in Maharashtra, India

ABSTRACT:

Ticks cause great economic losses to livestock, and tick-borne diseases are one of the emerging threats to livestock and public health in India. The chemical ectoparasiticides are being used to control these ectoparasites, but their residues are reported in milk and meat. Hence, it is important to find effective and eco-friendly control measures for ticks. The present study aimeds to determine the efficacy of botanical acaricides against ticks with respect to chemical ectoparasiticides in the Kolhapur district of Maharashtra, India. This study was conducted on the Holstein Frisian breed of cattle. Twenty-four cows from two different herds were selected for the trial, and the selected cows were quantitatively assessed for tick infestation. Four different doses of botanical ectoparasiticide, ‘GochidGo’, along with conventional chemical ectoparasiticides containing Amitraz 12.5% EC formulation, were taken for the trial. The cow sheds of both locations were treated with GochidGo and Amitraz 12.5% EC formulation at a dose of 7ml/lit of water. Tick mortality was counted in both cases. The highest mortality was recorded in the treatment of GochidGo at the dose of 5ml/lit of water, which was at par with Amitraz 12.5% EC formulation, but re-occurrence period of ticks was significantly ($p<0.05$) higher in the case of GochidGo formulation, which proved its long-lasting effect and it was found safe for the animals, environment as well as humans.

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Key Words : Ectoparasiticide, Ticks, GochidGo, Amitraz, Cattle, Bio-efficacy

1. INTRODUCTION

Worldwide, ticks are the second vector of infectious pathogens to humans after mosquitoes. Ticks are very important ectoparasites of animals, and their control is very important if livestock production is to meet the world's need for animal protein. Ticks transmit

disease, cause paralysis or toxicosis, and cause physical damage to livestock. Global economic losses from tick infestation have been estimated to be between $14,000 and $18,000 million per year, with India accounting for approximately $498.7 million [1].The successful survival of ticks depends on optimal temperature and humidity, which are the main components of the microclimate in their habitats, and the availability of suitable tick hosts in an urban location suitable for tick life [2]. A tick bite causes direct injury to the animal along with blood loss due to the tick feeding [3]. Ticks are carriers of animal pathogens, causing a large number of diseases by sucking blood [4]. The organisms like *Anaplasma marginale* causes ~~T~~tick fever, ~~organisms, like *Anaplasma marginale*,~~ are ~~significant causes of~~primarily responsible for cattle morbidity in Australia, USA, China and other countries [5]. Several methods are used to treat ticks and tick-borne diseases. In most cases, chemical acaricides are used to control ticks. They kill ticks, but they harm the animals and the environment. Chemical acaricides cause residues in milk, meat, and also promote the emergence of a resistant strain of ticks. Developing a new acaricide is a long and expensive process. Certain herbal mixtures ~~with~~ have 70% efficacy for tick control [6]. A wide range of acaricides, including organophosphates. c~~C~~hlorinated hydrocarbons, carbamates, and synthetic pyrethroids are commonly used to treat ticks. The effectiveness of acaricides depends on the quality and quantity of the active substance. Arsenic was the first effective method for controlling ticks and tick-borne diseases and was used in many parts of the world before chemical resistance was a problem [7]. Acaricide based on chlorinated hydrocarbons and organophosphates was used in the past in many countries of the world, but it causes acute toxicity in livestock and mammals and has developed problems of resistance. According to ~~Amrutha~~ Anand et al. (2021) there was ~~D~~development of deltamethrin resistance in certain species of ticks in Kerala [8].

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Various application methods are used to apply chemicals to surfaces, such as dipping, spraying, watering, etc. Direct application of acaricides to animals is the most popular method of tick control on livestock [3]. Application of acaricides to tick-infested cattle by dipping or spraying can be equally effective under ideal conditions with proper handling of equipment without injuring the animals and subsequently diluting the product [7]. A variety of tickicides including cottonseed oil, fish oil, crude petroleum, kerosene, creosote, tobacco extract, soap,

and a combination of sulfur and kerosene were among the hundreds of possible acaricides tested for dipping [9,10].

The present study was undertaken to evaluate the tick control effect of botanical acaricides' GochidGo' against chemical alternative products available in the market. A bio-efficacy study of GochidGo product containing *Cinnamomum* extract, *Allium sativum* extract, *Azadirachta indica* extract, *Lantana camera* extract and *Cymbopogon* extract was conducted in the Kolhapur district of Maharashtra on cattle of the Holstein Frisian breed.

2. MATERIALS AND METHODS

2.1 Study location

The study was conducted at Bhatanwadi village, located in the Karveer tahsil of the Kolhapur district in western Maharashtra. High rainfall along with a long winter season has been recorded in the district. Kolhapur district has a four-month rainy season starting from June to September; a four-month winter season from Oct to Jan; and a four-month summer season from Feb to May. The average annual rainfall of the Kolhapur district is 1200 mm. The average annual temperature ranges from 25 to 30 degrees Celsius. The villages were easily accessible and had large herds of cattle that had not been dipped for the past year. The study was conducted during the dry season (Jan to March). Tick infection was relatively high as compared to the rainy season. The major economic losses incurred by farmers due to tick infestations and tick-borne diseases included high morbidity and mortalities, as well as reduced production and reproduction performance in cattle.

2.2 Study details

The study animals were the Holstein Frisian breed of cattle, which were managed properly. Two herds of Holstein Frisian cows were selected for the study. Twenty-four cows from both herds were selected for the trial. The selection criteria were the severity of cattle infestation in the herds, the owner's willingness to try a new product, and whether the animal had many visible ticks on its skin. The age of the cow was 1-year minimum, with an average weight of 400 to 500 kg per cow. The ticks were counted on the selected animal before and after the trial. Every animal was examined for the presence of ticks on the head, neck, belly, ears, back, legs, perineum, and tail. Preliminary identification of ticks (based on body morphology and color) was done while the ticks were still attached to the animal body.

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Comment [A3]: 1 year… is it cow or heifer?

Comment [A4]: Production of cow?

Secondary observation of ticks for further confirmation is also done under a stereo zoom microscope with the aid of identification [11,12].

Four different doses of GochidGo was taken for the trial and one market product containing Amitraz 12.5% EC, were taken for comparative assessment. The cow sheds of both locations were treated with GochidGo as well as Amitraz 12.5% EC at a dose of 7ml/lit of water. Along with the anti-tick effects of both the ectoparasites, their antimicrobial activity has also been studied because microbial tick-borne diseases affect the productivity of livestock animals and cause a significant adverse impact on the animals. Animal skin irritation and tick recurrence have also been investigated. Following treatment was taken for the trial.

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Treatment Details

T1: GochidGo 1 ml/lit (2.5 lit water/animal)

T2: GochidGo 2.5 ml/lit (2.5 lit water/animal)

T3: GochidGo 5 ml/lit (2.5 lit water/animal)

T4: GochidGo 7.5 ml/lit (2.5 lit water/animal)

T5: Amitraz 12.5% EC 1 ml/lit (2.5 lit water/animal)

T6: Amitraz 12.5% EC 2.5 ml/lit (2.5 lit water/animal)

T7: Amitraz 12.5% EC 5 ml/lit (2.5 lit water/animal)

T8: Control (Water spray)

Statistical analysis???

3. RESULTS AND DISCUSSION

With the help of a portable magnifying lens, adults and matured ticks on the animal were preliminary identified (based on body morphology and colour) [11,12]. ~~A~~tThe selected animals were found infested with different species of ticks. The average number of ticks per animal ranged from 45 to 56. Tick mortality was counted after 72 hours of application in both cases. The data was statistically analysed and the standard deviation was calculated using an average of three replications. The highest mortality was recorded in treatment T3, which was at par with treatment T7 and significantly superior to control treatment T8. In the case of market check Amitraz 12.5% EC formulation, the highest mortality of ticks was recorded in the treatment T7, which was 91% after 72 hrs. of application. For GochidGo, one additional dose of 7.5 ml per lit (Treatment T4) was also tested and gave 100% tick control after 72 hrs of

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application. Reoccurrence of the ticks was observed after 60 days in treatment T3 and after 72 days in treatment T4, which was significantly superior to treatment T7 (Amitraz 12.5% EC, 5 ml per lit of water). In the case of skin irritation of the animal, Amitraz 12.5% EC at the dose of 2.5 ml and 5 ml per lit of water showed skin irritation in all the animals, whereas GochidGo did not showed skin irritation in any of the treatments. Similarly, Amitraz 12.5% EC formulation had a strong irritant smell, whereas GochidGo had a pleasant lemongrass smell. In preliminary trials, the GochidGo formulation showed antimicrobial activity against isolated microbes from cow skin.

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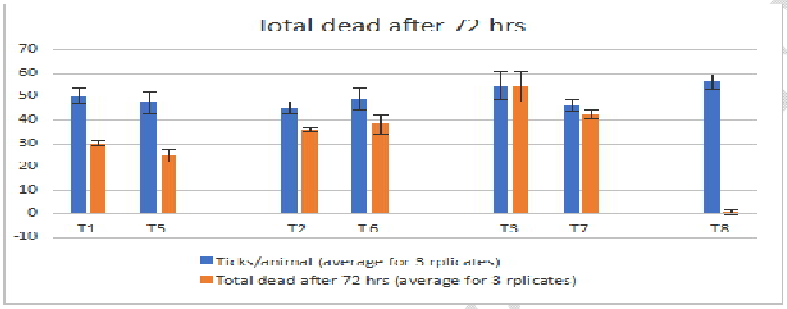

Fig.1. Effect of GochidGo application on Ticks

The favourable climatic conditions like temperature, suitable host, and cool and moist weather of western Maharashtra support the growth of ticks, but it is also observed that in a dry climate, tick incidence is also higher. Improper tick control measures and poor husbandry practices are also responsible factors for tick infestation. Feeding a large number of ticks causes weight loss and anaemia in the animal. Apart from causing irritation or anaemia in cases of heavy infestations, ticks can cause severe dermatitis [4]. These parasites generate direct effects on cattle in terms of milk production and weight gain [13,14]. Tick paralysis is most common in late winter and spring when the adult ticks are active, but it can occur at any time if the weather is warm and humid [15].

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Lack of proper tick control measured in an infested area, unawareness regarding the impact of ticks, lack of adequate veterinary infrastructure, and use of routine chemical acaricides are the factors responsible for high tick loads. Severe incidences of ticks reduce the productivity of an animal as well as increase the chances of animal mortality. According to Swai et al. (…), tick-borne diseases were the main cause of low productivity and cattle

mortality [16]. However, some authors [17,18,19] believe that animals not treated with acaricides achieve endemic stability against tick-borne diseases in due course of time. In addition, in the absence of routine use of acaricides, morbidities have increased; reduced production, as well as reproduction performance of adult cattle, have also been reported in different places [14, 20, 21].

Therefore, the present study demonstrated immediate, safe, and long-lasting tick control in an eco-friendly way. The frequent use of chemical acaricides causes major cattle losses through death and loss of productivity, which were reported by farmers. GochidGo showed that it has high acaricidal effects as it has given almost 97 to 100% tick control and the reoccurrence period of ticks has been significantly increased, which proved its durability. GochidGo has contact and a systemic mode of action. It acts as a stomach poison in ticks, disrupting cellular metabolism. GochidGo is extremely fast-acting and causes an immediate knockdown paralysis in ticks.

4. CONCLUSION

Th~~is~~ ~~leads to the conclude~~results revealed that the botanical ectoparasiticide GochidGo proved to be superior to chemical formulation. Cattle treated with GochidGo had excellent control of ticks for up to 60 to 72 days. In the case of the Amitraz 12.5% EC formulation, the reappearance of ticks was reported within 21 days after application, i.e., GochidGo gave three-fold longer control of ticks. The GochidGo formulation also acts as a fly repellent as no flies were seen in all the treatments of GochidGo. A strong irritant smell has been reported after the application of the Amitraz 12.5% EC formulation. whereas GochidGo showed no sign of irritation to the animal and operator. The antimicrobial effects of the GochidGo formulation need to be studied further against different disease causing microbes of cows.

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COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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