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Use of a homeopathic complex against *Haematobia irritans* infestation in dairy cattle, Paraná, Brazil

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Horn fly, *Haematobia irritans irritans* (Linnaeus), is an ectoparasite that feeds exclusively on the host's blood, preferably cattle, whose biological cycle occurs in its feces. This insect is scattered throughout Brazil in areas favorable to its development and also in other South American countries. The insect remains most of the day time on the animal. The adult fly can live 3 to 7 weeks. At high infestation rates, skin lesions may occur, predisposing the animal to bacterial infections. Biting activity is one of the harmful aspects of this fly; the painful bites cause irritation and stress in animals, impairing their development, milk production, reproductive activities, etc. Homeopathy is among some alternatives for parasite control aimed to seek means to control the major internal and external parasites in cattle, which are more efficient and less aggressive to animals and the environment. This study aimed to evaluate the efficacy of a homeopathic complex in 14 one-year-old Holstein heifers divided into two groups infested with *H. irritans* in a period of 60 days. There were statistically significant differences between groups in the number of horn flies on day 45 of the experiment, and the number of horn flies decreased in animals treated with the homeopathic complex. There were no significant differences between groups regarding hematocrit (%), total protein (g/dL), albumin (g/dL), and globulins (g/dL). The parasitic homeopathic complex proved to be effective against horn flies, with 64.7% reduction of these flies in animals at 45 days of experiment in treatment group animals.

Key words: Heifers, hematocrit, homeopathy, horn fly.

INTRODUCTION

The first records of horn fly (*Haematobia irritans irritans* (Linnaeus)) date back to 1830 in France, described by Linnaeus, later spreading throughout the rest of the world, especially where the cattle population was expanding, starting invasion in the Americas, first in the United States and then spreading across North America

and Central and South America (Brito et al., 2005).

In the mid-1970s, Brazil registers the entry of this parasite, first in the region of Roraima, spreading its habitat in other states, facilitated by climatic conditions (Brito et al., 2005). Climatic conditions in the tropics tend to favor the proliferation of insects for being exothermic

and having their metabolism regulated by external environment. However, the interference of rainfall cannot be cited as a determining factor, and although the parasite's cycle depends on soil moisture, a significant increase in horn fly infestation according to rainfall is not observed, and relative air humidity seems to have greater influence on the cycle of this parasite. The ambient temperature conditions have a more precise relationship with *H. irritans* infestation, which proliferation is higher at higher temperatures (Almeida et al., 2010; Bianchin et al., 2002, 2006).

The cycle of development of the horn fly is relatively fast, being determined by the temperature, humidity and quality of the fecal mass, during the winter, the interval of generations can extend up to twenty or thirty days, whereas in the rainy season this interval can be reduced to eight or nine days (Honer et al., 1990).

Damages caused by horn fly are relevant to the current livestock scenario, resulting in decreased consumption, feed conversion, weight gain and increased stress, especially in cattle. Its action causes discomfort, not only due to its blood-sucking habit, but mainly for irritating animals. Damages caused by this parasite are considerable, and Bianchin et al. (2004) report loss of 10% in revenue, reaching 15 kg less of yield in slaughter houses. In Brazil, the damage attributed to the horn fly with respect to the national cattle herd was estimated at US\$ 2.56 billion in 2012 (Grisi et al., 2014).

Taking into account the economic aspects and animal welfare, the use of synthetic products becomes a viable solution at first, but it should be taken into account that these drugs can leave residues in animal origin products (Dell'Porto et al., 2012), and there is also the imminent danger of *H. irritans* to create resistance.

Producers guided by the demands of the population in the agricultural market seek healthier solutions to problems in the productive sector. Thus, the use and acceptance of products that do not leave residues in food increase in relation to chemical insecticides to combat ectoparasites (Pinto et al., 2005), stressing the importance of intensifying research on alternative products.

Homeopathy has proven to be an alternative remedy to improve animal production, by providing effective improvement from the burden of many diseases with a further advantage over insecticide use in addition to its cost tends to be lower than other treatments (Santos et al., 2006). The presence of resistance to insecticides in horn fly and bovine tick populations (*Rhipicephalus (Boophilus) microplus*) is currently observed, being necessary to seek new treatment alternatives for the control of these ectoparasites.

Furthermore, the use of homeopathic medicines do not leave residues in animal origin products, and this is added advantage in relation to products such as antibiotics, organophosphates, antiparasitic agents that leave residues in food and harm the health of end users.

Martins et al. (2007) point out that homeopathic products have no grace period, and their derivatives may be marketed normally.

This study aimed to evaluate the use of a homeopathic complex in controlling *H. irritans* infestation on dairy cattle.

MATERIALS AND METHODS

This experiment was conducted at the campus II of the Paranaense University (UNIPAR) with the aim of evaluating the efficacy of a homeopathic complex administered to one-year-old Holstein heifers to control horn fly infestation.

Animals

Fourteen, one-year-old Holstein heifers were used in this experiment and were divided into two groups: treatment group (TG) with 7 animals and control group (CG) with 7 other animals. Animals were distributed in two equal paddocks with covered bays, giant star grass (*Cynodon plectostachyus*) and water *ad-libitum*, feed and mineral salt. The experimental units were randomly divided. The animals' weight gain, visual count of the flies, hematocrit (%), plasma levels of total proteins (g/dL), albumins (g/dL) and globulins (g/dL) were evaluated in this experiment.

Product

The parasitic homeopathic complex was specifically designed for this study, which composition includes *Abrotanum* 10⁻¹², *Arsenicum album* 10⁻¹², *Calcarea carbônica* 10⁻¹², *R. (Boophilus) microplus* 10⁻¹², *Bunostomum* species 10⁻¹², *Damalinia ovis* 10⁻¹², *Dermatobia hominis* 10⁻¹², *Ferrum metallicum* 10⁻¹², *H. irritans* 10⁻¹², *Haemonchus* species, 10⁻¹², *Linognathus stenopsis* 10⁻¹², *Musca domestica* 10⁻¹², *Nematodirus* species 10⁻¹², *Oesophagostomum* species 10⁻¹², *Oestrus ovis* 10⁻¹², *Ostetagia ostertagi* 10⁻¹², *Sulfur* 10⁻¹², *Strongyloides* species 10⁻¹², *Trichostrongylus* species 10⁻¹², and *Triochuris* species 10⁻¹². Treatment group of animals received daily 20 g/animal/day of homeopathic complex for 60 days, while control group animals received 20 g/animal/day of calcium carbonate, the homeopathic complex vehicle for 60 days.

Weighing and collections

Every two weeks, visual counting of flies in the cervico-dorsal-lumbar region of animals was performed between 09:00 am and 10:00 am as suggested by Almeida et al. (2005), in which flies present from the neck to the hip of each animal were counted. Then, the animals were contained in individual trunk to collect blood samples by puncture of the tail vein for analysis of hematocrit, total protein, albumin and globulin; they were then individually weighed, and collections occurred every 30 days.

RESULTS

The use of the homeopathic complex to control *H. irritans* showed significant difference in relation to the control group at 45 days of the experiment (D45) ($p < 0.05$). The animal weight results (kg) and the number of horn flies in

Table 1. Mean \pm standard error of animal weight (kg) and number of horn flies in Holstein heifers receiving or not diet enriched with homeopathic complex on days 0, 15, 30, 45 and 60 of treatment (D0, D15, D30, D45 and D60, respectively).

Treatment	Weight (kg)	Number of horn flies
CG D0	211.85 \pm 8.75	35.86 \pm 7.70
TG D0	200.57 \pm 21.56	34.14 \pm 7.98
CG D15	204.14 \pm 17.08	20.14 \pm 7.09
TG D15	216.29 \pm 13.77	09.26 \pm 3.50
CG D30	215.00 \pm 16.05	23.49 \pm 7.55
TG D30	251.29 \pm 23.39	10.43 \pm 3.15
CG D45	219.00 \pm 21.94	19.57 \pm 4.01 ^a
TG D45	237.00 \pm 28.59	07.86 \pm 1.61 ^b
CG D60	210.57 \pm 10.69	25.85 \pm 7.47
TG D60	204.43 \pm 15.86	09.60 \pm 3.63

*Difference in letters mean statistical difference ($p < 0.05$) between groups.

animals are shown in Table 1.

In addition to hematophagous activity of *H. irritans*, it causes stress in animals, which in an attempt to get rid of them, the animals waste energy, reducing food and water intake, leading to weight loss. These factors may alter certain hematological parameters.

Table 2 shows the results of hematocrit, total protein, albumin and globulins of Holstein heifers treated with homeopathic complex and control group.

DISCUSSION

For greater productivity in cattle herds, animals should always be the closest as possible of their homeostasis, using few resources of their body energy. These losses in cattle performance directly affect economic parameters in the sector.

This study found significant difference in the number of flies on D45 (Table 1), and the decrease in the count of flies from D15 should be taken into account, and on D60, although no statistical difference was observed, the mean difference in the count of flies was 25.85 ± 7.47 in CG and 09.60 ± 3.63 in TG. In the final experiment's phase, a weight loss was observed in the animals of the two groups, this factor is due to the start of the winter period with the decrease in supply for the African star grass (*Cynodon plectostachyus*).

Pinto et al. (2005), using a homeopathic complex composed of biotherapies mixed in the mineral supplementation of Nelore heifers over 12 months, observed that the homeopathic core showed preventive effect on parasitism by *Dermatobia hominis* larvae. Salla et al. (2015) applying a homeopathic medicine topically in cattle, observed the effectiveness of the product against *H. irritans* for 30 days.

According to Signoretti et al. (2008), the use of homeopathic complex showed significant differences, decreasing the development of ticks in the larval and

adult stages; however, no significant differences were observed in the nymphal stage.

According to Marques et al. (2008), using pyrethroids, organophosphates, avermectin, phenyl pyrazoles, benzoylphenyl urea and homeopathic products, it was shown that all treatments were effective against horn fly in zebu-crossed or crossbred animals. However, one should take into consideration chemicals that may harm the African beetle cycle (*Digitonthophagos gazela*) that are in the feces, and these insects act as natural predators of flies, so the control of *Haematobia irritans* with 100% organic supplies is more environmentally interesting.

Signoretti et al. (2010) observed that with the continuous use of homeopathic products, there was no need for the use of chemicals to control ticks and horn flies, indicating the effectiveness of the use of homeopathic products.

According to Arenales (2002), homeopathic medicine does not promote the killing of flies, but the feces of animals undergoing treatment prevent continued insect cycle, not allowing the larval stages to become pupae, which demonstrates the effectiveness of treatment on D45 and the reduction of flies on D60.

Ferreira et al. (2014) used stable flies (*Stomoxys calcitrans*) and houseflies (*Musca domestica*) to produce a biotherapeutic at dilution 10^{-12} and observed on the 8th day of experiment a 19% reduction of stable flies and 61% of houseflies and on the 15th day, there was a reduction of 20 and 53% for stable flies and houseflies, respectively. In the present work on the 15th day of treatment, there was a 29.2% decrease of horn flies in treatment group animals when compared with the control group animals.

There was no significant difference in the hematologic parameters (Table 2) between experimental and control groups, and the hematocrit values found are below the reference values (Table 3) in both groups and in all

Table 2. Mean \pm standard error in the analyses of hematocrit, total proteins, albumin and globulin of Holstein heifers receiving diets enriched or not with homeopathic complex on days 0, 30, 60 of treatment (D0, D30 and D60, respectively).

Treatment	Hematocrit (%)	Total proteins (g/dL)	Albumin (g/dL)	Globulins (g/dL)
TG D0	21.93 \pm 0.97	7.83 \pm 0.24	3.17 \pm 0.12	4.66 \pm 0.21
CG D0	22.20 \pm 0.69	8.17 \pm 0.20	3.35 \pm 0.06	4.76 \pm 0.24
CG D30	20.24 \pm 1.07	7.06 \pm 0.35	2.88 \pm 0.11	4.18 \pm 0.37
TG D30	21.36 \pm 1.17	7.13 \pm 0.25	2.86 \pm 0.16	4.25 \pm 0.14
CG D60	22.20 \pm 0.60	7.13 \pm 0.39	2.95 \pm 0.14	4.18 \pm 0.27
TG D60	22.33 \pm 0.80	6.93 \pm 0.17	2.93 \pm 0.08	4.00 \pm 0.15

*Not significant by analysis of variance.

Table 3. Reference values for bovine.

Analysis	Unit	Values
Hematocrit	%	24-46
Total proteins	g/dL	6.6-7.5
Albumin	g/dL	2.7-3.8
Globulin	g/dL	3.0-5.8

Source: Kaneko et al. (1997) and Jain (1993).

collections. The values obtained for total protein were slightly above the reference values in both groups at D0, becoming normal subsequently. Albumin and globulin values were within the reference values (Table 3). According to Pogliani and Birgel Jnr. (2007), animals raised under different environmental, climatic and management conditions can present variations of blood constituents. The values obtained for animals raised in a region cannot be considered without an adequate evaluation as a reference outside this region.

The use of homeopathic medicines can decrease the number of chemotherapeutic applications in animals and reduce the selection pressure of tick and fly strains still susceptible to conventional treatments, in addition to its allowed use in cattle kept in organic production system, acting on the welfare of animals and reducing stress (Honorato, 2006).

Conclusion

Oral supplementation with homeopathic complex under the experimental conditions evaluated reduced the number of horn flies at 45 days of experiment. The parasitic complex homeopathic proved to be effective against horn flies.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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