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**The effect of subcutaneous administration of thyme and black pepper essential oils on sheep hematological responses**

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Thyme *(Thymus Vulgaris)* is a low growing herbaceous plant native to southern Europe and black pepper (*Piper Nigrum*) is a flowering vine in the family *Piperaceae* which is native to India. The immunomodulatory effects of the essential oil (EO) of these plants have been previously reported. The aim of this study was to evaluate the effect of subcutaneous administration of thyme and black pepper EOs on the hematological characteristics of kordi lambs (body weight: 27 ± 3 kg; age: 180 ± 14 days). The essential oils were prepared by the steam distillation method using water in a Clevenger apparatus and diluted (1:10) in saline (0.9% NaCl). Two h after the morning feeding, of each EO 40 µl per kg body weight were applied subcutaneously once per day for 1, 3 or 7 days. Animals (n=12) were divided into 3 groups with 4 replicates per group. Group 1 as control received saline alone and groups 2 and 3 received thyme and black pepper EOs, respectively. One day after the end of the respective administration period blood was taken from the jugular vein and sampled in heparinized tubes Samples were analyzed for packed cell volume (PCV), hemoglobin (HB), red blood cell (RBC) and white blood cell (WBC) numbers. Data were statistically analyzed using a 3x3 factorial arrangement. Packed cell volume (26.5%), HB (9.5 g/dl) and RBC ($9.9x10^4$ /µl) were significantly ($P< 0.05$) lower in the animals given black pepper EO compared with those of the control (30.5%, 10.8 g/dl and $11.5x10^4$/µl, respectively). However, there was no significant effect of thyme EO on the hematological parameters of the animals evaluated. When EOs were applied for 3 days, PCV (%) and HB (g/dl) were significantly declined compared with values obtained after 1 day EOs application (9.8 and 27.8 vs. 10.8 and 30.6). Compared with animals that received 1 EOs for day ($11.5x10^4$/µl), RBC counts were significantly ($P < 0.05$) reduced in animals that received the EOs for 3 and 7 days ($10.3x10^4$/µl and $10.4x10^4$/µl, respectively). There was no significant ($P > 0.05$) effect of the administration period or the EOs on the number of WBC. In conclusion, black paper at the concentration used in the present study, might cause an anemia as both HB and RBC were declined in the lambs whilst WBC remained unchanged.

Sheep; thyme; black pepper; essential oil
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