

EFFECTS OF GLOBAL WARMING ON ANIMAL BREEDING

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Abstract

Gases such as carbon dioxide released into the atmosphere cause an increase in the average temperatures of ground crust and seas, called global warming. When the effects of global warming on animals are examined, they emerge as the direct effects of physical biological, chemical environment or climate. Due to extreme climatic conditions, decreases can be observed in reproduction, milk and meat yield. Extreme heat conditions have an effect on milk quality and quantity of milkers and cause shortening of lactation period. In addition, decreasing fertility, prolongation of the first insemination time due to the inability to detect the estrus, decrease in the blood flow to the uterus due to the increased body temperature resulting from high atmospheric temperature; all these lead to decreasing rate of fertilization, reduction of embryonic development and early embryonic deaths. In addition, growth and development of pups are negatively affected by these conditions. In feed animals, decrease in feed intake, decrease in feed conversion ratio and prolongation of feeding period have been observed. Factors such as climate change in bee breeding cause low productivity per colony and increase in honey bee diseases and pests. In bee breeding, other problems encountered are increasing stress induced by high temperature and decreasing productivity in egg production.

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INTRODUCTION

Global climate change caused by global warming affects our daily lives more and more every day. Climate change is a result of temperature changes and related effects, as well as of the changes in the composition of gaseous components in the atmosphere. Climate change occurs in the Mediterranean with a marked reduction in precipitation in the northern Mediterranean regions, especially in warm climates. This is related to the shift in the direction of the Atlantic wind to the north. At the same time, significant warming is expected, especially in the summer months. Climate change spanning more than one year may cause more extreme temperature events to occur. Estimates with regional climate change models show that the Mediterranean can be a region susceptible to global change (Giorgi and Lionello, 2008).

As a result of global warming, glaciers melt, sea levels rise, fresh water sources dry and species disappear. In particular, Turkey is one of the countries to be more affected by the consequences of global warming. There are serious concerns in our country that summer and winter temperatures will increase, precipitation will decrease, water levels in our seas will rise and agricultural production will decrease (Varol and Ayaz, 2012). For example, the arid and semi-arid regions, such as South East and Central Anatolia, which are under the threat of desertification rather than the threat of increase in temperature and the semi-humid Aegean and Mediterranean regions that do not have sufficient water will be more affected. The climate changes that will occur will cause changes in the natural habitats of animals and plants in agricultural activities, especially in the regions mentioned above, will cause significant problems in terms of water resources (Öztürk, 2002). Global warming can lead to the emergence of new species invasive in nature that are not local to the region; thus, local species can leave their habitat. One of the most remarkable effects of global warming today is the disappearance of some living species from the world (Doğan et. al., 2015).

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Animal production is heavily intensified to meet the animal protein need of the growing population. The effects of the practices aimed at increasing productivity in animal production on the environment have been negative and with the emergence of the concept of global warming, attention has been directed to animal production. Animal production may have a negative impact on many aspects of the environment such as air and water pollution, soil quality degradation, biodiversity reduction and climate change. In a report issued by FAO, it is stated that animal production is the main factor in global warming and climate change (Steinfeld et al., 2006). In the same report, it is pointed out that meat, egg and milk production accounts for about 18% of the human-induced greenhouse gas emission, which is more than that produced by the different vehicles used by people (Steinfeld et al., 2006).

Greenhouse gases, which have an indispensable place in the climate system, cause the atmosphere to warm by keeping the long-wave infrared lights reflected back into space. The greenhouse gases are naturally found in nature and also occur as a result of various activities of people. What is abundantly found in greenhouse gases is water vapor emitted into the atmosphere through evaporation from oceans, seas, lakes and rivers (Atalık, 2005).

Gases that affect global warming are carbon dioxide (CO₂), methane (CH₄) and diazot monoxide (N₂O). Carbon dioxide (CO₂) is the second most common greenhouse gas. It is emitted into the atmosphere as a result of many natural events such as decay of organic matter, respiration of animals and people, volcanic eruptions.

In addition, the burning of fossil fuels, solid wastes, wood and wood products for heating, transportation and electricity production increase the amount of CO₂ released into the atmosphere. Since the Industrial Revolution in the mid-eighteenth century, the amount of it in the atmosphere has increased by 31% from 281 ppm to 368 ppm (Atalık, 2005).

Methane (CH₄) is a gas that creates more effective insulation in the atmosphere. Coal is incorporated into the atmosphere during the production and transportation of natural gas and oil. Methane emerges from ruminant animals as well as from some animals as digestive by-products and from the degradation of organic matters in waste areas (Atalık, 2005). Since the Industrial Revolution, the amount of methane in the atmosphere has more than doubled. Diazot monoxide (N₂O) is mainly emitted by the processing of agricultural soils and burning of fossil fuels. It is a gas with very strong insulating properties. Its atmospheric amount increased by 17% compared to the level before industrialization (Atalık, 2005).

EFFECTS OF ANIMAL PRODUCTION ON GLOBAL WARMING

In recent years, intensive and industrial animal production has developed 2 times more rapidly than traditional integrated animal production and 6 times faster when compared to extensive animal breeding relying on grazing on pasture (Verge et al., 2007). The animal production sector capacity is expected to double by 2050 to meet the demand for animal products (Steinfeld et al., 2006). As a result of the intensification of animal production, the increase in herd size, the low availability of land in the densely populated areas, the insufficient land areas of livestock farms or the sector's inability to compete with other branches of agriculture, the negative practices in animal welfare, unhealthy use of fertilizer and the inefficient use of nutrients at the soil and animal level increase the amount of hazardous emissions (such as phosphorus, nitrogen, methane, CO₂) (Görgülü et al., 2009).

THE EFFECTS OF GLOBAL WARMING ON ANIMAL BREEDING

The effects of global warming on animals emerge as direct effects of physical, biological and chemical environment or climate. Physical environmental conditions are manifested through the effects of maintenance and feeding conditions. Because of extreme climate conditions (too hot or too cold), sheltering becomes more costly, and regressions may occur in some performance-related properties such as reproduction, milk and meat yield. It has been shown that extreme hot conditions have an effect on milk quality and quantity in dairy animals and cause shortening of lactation period (Beede et al., 1985; Chase et al., 1988; Bucklin 1991; Alnaimy et al., 1992). The research focusing on reproduction performance revealed a decrease in fertility (Alnmier et al., 2002; DeRensis and Scaramuzzi 2003; Drew, 1999), prolongation of the first insemination time due to the inability to detect the estrus (Alnmier et al., 2002; DeRensis et al., 2002), decrease in the blood flow to the uterus due to the increased body temperature resulting from high atmospheric temperature; all these lead to decreasing rate of fertilization, reduction of embryonic development and increase in early embryonic deaths (DeRensis et al., 2002). In addition, growth and development of pups are negatively affected by these conditions (Koluman Darcan et al., 2009; Çoban et al., 2008; Darcan, 2005). Decrease in feed intake, decrease in feed conversion ratio and prolongation of feeding period have been observed in livestock (Davis et al., 2001a; Davis et al., 2001b; Göncü and Özkütük, 2003; Silanikove, 2000; Harner et al., 1999; Linn, 1997).

Climate change has indirect influences on issues such as the quality and quantity of feed given to animals, feeding strategies, seasonal availability of pastures, genetic studies (crossbreeding, etc.), the number of animals and animal health. The quality of the feed given to animals are important in the rations prepared. Grain (barley, wheat etc.) and oilseed residues (cottonseed pulp, sunflower seed pulp, etc.) used as feeds enable the rations to be prepared at the lowest cost without losing the nutritional value (Koluman Darcan et al., 2009).

The production of pasture or forage will be interrupted due to the reduction of water resources and areas where plant production can be made. Since the areas where crop production can be done will be reduced due to many causes such as rising sea levels, drought and salinity, there will be tendencies to produce foods for primarily human nutrition in existing areas. Competitive power of feed production will be reduced due to economic reasons and priorities. Accordingly, the first problem expected to emerge as an animal feeding problem will be the decreasing competitive

power. As a result of changing precipitation regime, drought will occur in some of the agricultural lands and salinity problem will be experienced in some others. Therefore, in the areas where plant production is made, there will be competition between fodder plants and alternative plants and here the main determining factor will be the cost (Koluman Darcan et al., 2009).

Genetic improvement research conducted on animals to improve their productivity has always been on the agenda. However, it is necessary to take into account the fact that local animals can maintain their efficiency under all conditions and are advantageous against adverse effects of the environment. Therefore, studies on genotype should be based on selection. Since the characteristics of domestic gene sources such as life expectancy, animal health and productivity are also effective on greenhouse gas emission, they will be able to continue their advantages over hybrid breeds in the case of climate changes. At the same time, they are less affected by short heat waves due to their anatomical and physiological structures and they can maintain their body temperatures by easily removing the extra heat loaded with the help of their mechanisms. Besides the efficiency level, life expectancy can be influenced by climate changes. Increase is expected in events such as droughts, floods and epidemic diseases due to climate change. Therefore, it is important to start to use animals that are resistant to drought and diseases in the production. Skin, hair type, sweat gland capacity, ability to sustain reproduction and yield in difficult conditions, resistance to diseases and parasites, metabolic heat production, tolerance to thirst and some adaptation-oriented characteristics such as anatomical and morphological structures are some of the factors gaining great importance in the face of climate changes (Koluman Darcan et al., 2009).

In terms of animal health, some diseases will pose a significant threat to animal husbandry in terms of treatment costs, yield losses and immunity in the future (blue tongue and gastroenteritis, etc.). In the emergence of such diseases, factors such as shortening of cold seasons with temperatures lower than 15 ° C, more easily proliferating vectors and increasing temperature of atmosphere will be highly influential. The socio-economic impacts of global warming will be highly effective in the form of food shortages, especially in areas with limited natural resources. Consequently, non-natural sources will become widespread in production and conventional methods will be developed and used to achieve higher efficiency from a unit area (Koluman Darcan et al., 2009).

Changes expected to occur in the global climate will change the behavior and life of honey bees. Increases in the temperature and humidity in autumn will directly affect the development of honey bees and cause problems in wintering (Şahinler et al., 2008).

Global food production is impossible without pollinators such as honey bees. In recent years, however, honey bee population worldwide has been alarming with increasing mortality rates. These difficulties faced by honey bees give rise to the question of the future of our food supply. In addition, contagious diseases are one of the main factors in increasing varroa destructor honeybee mortality rates. Varroa destructor is a parasitic mite and is bound to the honeybee cub for its reproduction and can finish the whole colony. On the other hand, climatic changes can have a significant impact on honeybee growing cycle and mortality rates. Climatic weather events affect vegetation and therefore the ability of the honey bee to search for food (Switanek et al., 2015).

Being one of the stress factors in beekeeping, the climate directly affects the nutritional resources bees need, and therefore, it is tried to get the maximum yield from the flora by intensive migrant beekeeping in our country. Sudden climate changes; if the required measures are not taken, will result in unqualified queen bee production, decreasing resistance of weak colonies against diseases and pests, and eventually the colony's extinction (Topal et al., 2016).

CONCLUSION

Strategic planning for the future should be made by taking into consideration the scenarios and predictions put forward by scientists in our country, which is under great threat of global warming and climate change. Accordingly, some practices in the livestock sector, which are conducive to greenhouse gas emissions, regional strategic plans and the political and socio-economic structures related to them, are important for minimizing the negative impacts. Focusing more on multidisciplinary scientific research and cooperation programs may help solve the potential problems of the future animal production, food safety and nutrition in Turkey.

As a result of many factors such as shortening of cold seasons with temperatures lower than 15 ° C, more easily proliferating vectors and increasing temperature of atmosphere, some diseases in animal breeding and cost of cures to these diseases have been increasing, which will pose a serious threat to productivity. In this regard, some precautions should be taken.

Animal breeding is negatively affected by global warming and climate change. Changes occurring in the climate lead to serious problems for breeders. Necessary precautions should be taken and planning should be done without delay and stakeholders and authorities of the sector should conduct necessary works.

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