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ANIMAL GENETIC RESOURCES IN SERBIA

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ABSTRACT

In the last few decades, farm animal genetic diversity has rapidly declined. Therefore, it is in the interest of the international community to conserve the livestock genetics. *In situ* (live animal herds) model of genome conservation is expensive and limited for practical usage. Therefore, *ex situ* (*ex vivo*) conservation model is developed to cryopreserve animal genetic resources in genome (gene banks) to regenerate a particular population in future. In Serbia, only in situ (*in vivo*) model of animal genetic resources preservation is performed. Autochtone animal breeds preserved in Serbia: cattle (Busha and Podolian), Domestic buffalo, horses (Domestic mountain horse and Nonius), Balkan donkey, pigs (Mangalica, Moravka, Šiška, Resavka, Šumadinka), sheeps (Cigaja, Sjenička, Svrljiška, Pirotska, Karakačanska, Lipska, Krivovorska, Bardoka, Vitoroga pramenka), goats (Balkan goat), dogs (Šarplaninac, Serbian shepherd dog, Serbian hound, Serbian tricolor hound Serbian yellow hound), poultry (Sombor chicken, Banat chicken, Svrljig chicken, Kosovo chicken, Domestic turkey, Domestic goose, Domestic duck) and pigeons (Serbian flyer, Sombor flyer, Niš flyer, Backa tumbler and Vršac tumbler).

Key words: animal; genetic resources; preservation; *in situ*

INTRODUCTION

In the last few decades, almost all farm animal breeds are experiencing a significant decrease of genetic diversity (Prentice and Anzar, 2011). This is a result of intensive genetic selection for small number of productive and reproductive traits (Buerkle, 2007), application of modern biotechnologies in reproduction, that allowed the production a large number of progeny from a single individual, as well as use the effective methods of transport and long-term storage of sperm cells, oocytes and early embryos (Patterson and Silversides, 2003). Conservation of genetic biodiversity of domestic animals is a global imperative in the biological, economic and moral sense; biologically, because biodiversity is a key condition for survival of life on our planet, economically, because a human population uses a huge number of animal species for food, medicine, chemicals, technological materials and energy. Moral, because man, as dominant species, is responsible for the maintenance and protection of all other species of living organisms, with which it must live on this planet. Thus, biodiversity preservation in domestic animal breeds and gene banks formation is in the interest of the international community (Prentice and Anzar, 2011).

Gene banks are defined as systematic and organized collection, preservation and exploitation of genetic material, by *in situ* (*in vivo*) or *ex situ* (*ex vivo*) methods. The *in situ* (*in vivo*) method involves preservation and reproduction of the small herds of various animal species, breeds, and lines (Wildt, 1999; Stančić, 1999). The major advantages for *in situ* conservation relate to the availability of technologies and the utilization of the breeds. The *in situ* conservation of live populations requires no advanced technology. There are optimal sampling strategies and breeding strategies, but the basic needs of an *in situ* program are already available and affordable throughout the world. The farmers of every region and nation know how to manage and maintain their local strains. They already have the capability; all they require is a direction.

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The disadvantages of *in situ* conservation are brought about by a lack of complete control over the many factors which influence the survival of individuals and therefore the genetic makeup of the conserved population (Henson, 1992; Furukawa *et al*., 1998). The method *ex situ* (*ex vivo*) involves long-term storage of gametes (sperm cells and oocytes) (Johnston and Lacy, 1995; Stančić, 2000, Stančić *et al*., 2001; Stančić *et al*., 2002; Stančić *et al*., 2005; Stanković, 2012) or early embryos by cryopreservation technology (Stančić, 2004; Boettcher, *et al*., 2005; Pereira and Marques, 2008; Prentice and Anzar, 2011; Chrenek *et al.*, 2013) as well as by cryopreservation of testicular or ovarian tissue somatic cells (Andrabi and Maxwell, 2007; Pereira and Marques, 2008). The major advantages for *ex situ* conservation is the relative cost of collecting, freezing and storage of frozen material, as compared to maintaining large scale live populations, has been estimated to be very low. In particular, once the material has been collected, the cost of maintaining a cryogenic store is minimal. Such banks require little space and few trained technicians. A very large number of frozen animals from a large number of populations can be stored in a single facility. Cryogenically preserved populations suffer from genetic loss due to selection or drift. The method places a sample in suspended animation and that sample remains genetically identical since the time of collection to the time of use. Frozen animal genetic resources can be made available to livestock breeding and research programs throughout the world. The principal disadvantages of *ex situ*, or cryogenic preservation lie in the availability of the necessary technology and access to the frozen populations (Henson, 1992; Furukawa *et al*., 1998).

The aim of this paper is to present the current situation of animal genetic resources preservation in Serbia.

ANIMAL GENETIC RESOURCE PRESERVATION IN SERBIA

Serbia accepted the FAO global rules for animal genetic resource conservation, which are defined in the Convention on Genetic Diversity (Rio de Janeiro, 1992). According to these rules, three state and several individual farms were formed in Serbia to preserve the herds of indigenous breeds of domestic mammals (cattle, horses, donkey, sheep, goats and pigs) and birds species (chickens, geese, ducks, turkeys and pigeons) (Stojanovic and Pavlovic, 2003).

According to the Serbian plan for animal biodiversity preservation for the period 2011-2018 („Official Gazette of RS“, no. 13/2011), the following breeds of domestic mammalian and avian indigenous species are *in situ* (*in vivo*) preserved: Cattle (Busha

Table 1: *In situ* preserved indigenous breeds in R. Serbia

Species	Breed	No. of animals in the preserved herds
Horse	Domestic mountain horse	80
	Nonius	90
Donkey	Balkan donkey	350
Cattle	Busha	750
	Podolian cattle	350
Buffalo	Domestic buffalo	1100
Pigs	Mangalica	2000
	Moravka	100
	Resavka	35
	Šiška	
	Šumadinka	
Sheep	Krivovirska	250
	Pirotska	60
	Lipska	250
	Bardoka	40
	Karakačanska	125
	Vlaška vintoroga	450
	Cigaja	400
	Svrljiška	200
	Sjenička	300
Goats	Balkanska	250
	Svrljiška	200
Dogs	Šarplaninac	200
	Serbian shepherd dog	200
	Serbian hound	150
	Serbian tricolour hound	150
	Serbian yellow hound	100
Chickens	Somborska kaporka	200
	Banatski gološijan	1000
	Svrljiška	200
	Kosovska	200
Turkeys	Domestic turkey	180
Geese	Domestic goose	300
Ducks	Domestic duck	100
Pigeons	Serbian flyer	200
	Sombor flyer	200
	Niš flyer	150
	Bačka tumbler	150
	Vršac tumbler	100

Source: „Official Gazette of RS“, No. 13/2011.

and Podolian), Domestic buffalo, Horses (Domestic mountain horse and Nonius), Donkey (Balkans donkey), Pigs (Mangalica, Moravka, Šiška, Resavka, Šumadinka) Sheep (Tsigai, Sjenička, Svrljiška, Pirotska, Karakatčanska, Lipska, Krivovirska, Bardoka, Vitoroga pramenka), Goats (Balkan goat), Dogs (Šarplaninac, Serbian shepherd dog, Serbian hound, Serbian tricolour hound Serbian yellow hound), Poultry (Sombor chicken, Banat chicken, Svrljig chicken, Kosovo chicken, Domestic turkey, Domestic goose, Domestic duck) and Pigeons (Serbian flyer, Sombor flyer, Niš flyer, Bačka tumbler, and Vršac tumbler). Number of populations of certain species of domestic mammals and birds, according to state records since 2011 is shown in Table 1.

CONCLUSION

According to FAO reports (2007), in all species of domestic animals an increasing decline in biodiversity is observed. Therefore, there is a global increasing demand for efficient biotechnological research methods of long-term conservation of genomes of existing species, breeds and lines of farm animals.

Preservation of genetic resources is carried out using method *in situ* (*in vivo*), forming small herds of certain species of animals, or *ex situ* (*in vitro*), using long-term cryopreservation of sperm, oocytes, embryos or reproductive tissue somatic cells (testis and ovaries). Thus, it is possible to perform multiplication of desirable genotypes, when the need arises, although the donor animals are dead for a long time. Although cryopreservation technology has progressed in recent decades, the success of survival of frozen oocytes and embryos is still not satisfactory. Previous studies have shown that early embryos are more tolerant to cryopreservation than oocytes. In addition, cryopreservation technology is complex and expensive and not available for widespread use. It is therefore necessary to combine the use of methods of *in situ* and *ex situ*, with the aim of successful conservation of biodiversity of domestic animal breeds.

In Serbia, only *in situ* method for indigenous breeds of mammalian and avian species is performed.

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