Hematological parameters of health status in the common toad *Bufo arenarum* in agroecosystems of Santa Fe Province, Argentina

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**Abstract.** We compared some hematological parameters and values of plasma cholinesterase activity in adult *Bufo arenarum* from a control site and agricultural sites. The mean values of the plasma cholinesterase activity did not vary among toads collected in pristine forest and agricultural sites. The blood parameters (hematocrit, hemoglobin concentration, white blood cells, and heterophils) from agricultural sites differed from the control site. The results suggest a high pesticide impact from intensive cropping in mid-eastern Santa Fe Province of Argentina.

**Key words:** Agroecosystem; Argentina; *Bufo arenarum*; hematological parameters; pesticide; plasma cholinesterase.

**Introduction**

Amphibians are often identified as a group of organisms that are particularly sensitive to environmental pollutants because their double life-cycles and relatively permeable skins provide more opportunities for exposure to pesticides than those of other vertebrates (e.g. U.S.EPA, 2002; Mann et al., 2003). Moreover, amphibian populations are declining worldwide and one of the many contributory factors proposed for this phenomenon is agricultural intensification (Kiesecker et al., 2001; Alford et al., 2001; Christin et al., 2003).
In Argentina a wide range of pesticides are commonly used in agricultural practices. Bullacio and Panello (1999) listed a broad group of agrochemicals such as pyrethroids (e.g. deltamethrin, cypermethrin, alfamethrin), chlorinated (e.g. endosulfan, acetochlor), organophosphorus (e.g. monocrotophos, fenitrothion) or carbamate (e.g. carbofuran, carbendazim) pesticides. Among these agrochemicals, organophosphorus, carbamate and pyrethroid compounds constitute an important group of pesticides with an intensive use in Argentina (CASAFE, 1999). There is not a reliable database on the consumption and application rate of pesticides in Argentina. However, studies conducted in the provinces of Entre Ríos and Santa Fe (Argentina) during 2000-2004 revealed residues of organochlorine pesticides in amphibian tissues (Lajmanovich et al., 2002) and high sensitivity to pyrethroids (Izaguirre et al., 2000). In addition, malformations (Peltzer et al., 2001) and inhibition of plasma cholinesterase (Lajmanovich et al., 2004) were reported in anurans collected in the same region. These studies indicate that investigations into the toxic effects of pesticides in amphibian populations from the areas surrounding crop fields in Argentina are necessary.

Biomarkers are essential to assess the environmental and health risks of exposure to potentially toxic chemicals (NRC, 1987). In particular, changes in blood parameters can be useful in some species as biochemical markers of toxicity for pesticide exposure (Haratym-Maj, 2002). As part of a continuing study to assess the adverse effect from pesticides on a population of anurans, the aim of this work was to establish some hematological parameters of adult \textit{Bufo arenarum} from a control site and from agricultural sites. Plasma cholinesterase (ChE) activity was also assayed. \textit{B. arenarum} was selected because it has an extensive distribution in Neotropical regions (Cei, 1980), and it is frequently found in agricultural lands and urban territories.

**Materials and Methods**

The study area was situated in the mid-eastern area of Santa Fe Province (Argentina) (fig. 1). Because intensive agriculture was introduced to this area in the 20th century, the remaining forest is restricted primarily to riparian woodlands surrounded by croplands and pastures.

24 adult male \textit{B. arenarum} were collected by hand from four sampling sites (\(n = 6\) for each site); one control site, located in a pristine forest (PRB: Paraná River Boundary, 31\(^\circ\)42’S 60\(^\circ\)30’W), and three agricultural sites: Monte Vera (site A), Monte Vera (site B) and Angel Gallardo, situated in suburban woodlands (fig. 1). These three areas differed in the degree of human disturbance, successional stages and crop. Monte Vera (site A) (MVA, 31°32’S 60°41’W), Monte Vera (site B) (MVB, 31°30’S 60°40’W) and Angel Gallardo (AG, 31°33’S 60°40’W) were often used for intensive agricultural production with transgenic soybean. Vegetables such as lettuce, tomato, and spinach were also cultivated.