

Tomato leaves: The first report of malformation in chick embryos

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Abstract. According to some reports, tomato leaves are toxic and toxicity tests have not been carried out for assessing of leaves. Therefore, their toxicity was analyzed in chicken embryos, which were injected with leaf extraction in 0.1, 1 and 10 mg concentration. Higher group had 100% mortality and considerable abnormalities were observed in the other groups. It is concluded that tomato leaves have the teratogenic potential in chicken embryos and these results confirm that tomato leaves could pose potential risk for human and animal health.

Keywords: tomato leaves, toxicity tests, abnormality, chicken embryo.

Plants are unique in their ability to produce an extraordinary array of different secondary metabolites. Many of these metabolites have medicinal or toxic attributes (Barthelson et al. 2006). 5-10% of poisonings is related to toxic plants. Over the past decade, several adverse effects and sometimes life-threatening have been recorded from consuming herbal plants. Many reports of adverse effects are associated with hepatotoxicity, kidney, nervous system, blood effects, mutagenicity, teratogenicity and carcinogenicity (Saad et al. 2006).

The whole portions of some vegetables are not edible but mostly people think different portions of these kind plants are safe, being a natural product. Therefore, it is possible that the toxic portions of plants enter the food chain. For example, *Solanum lycopersicum* or tomato leaves', green fruits' and stems' are toxic. The tomato plants are grown and used extensively throughout the world. Lycopene, one of nature's most powerful antioxidants, is present in tomatoes. Tomato leaves are traditional food in some parts of the world. Also, a product which is made with green fruit in vinegar is consumed. It is possible that harmful ingredients can remain active in vinegar. Therefore, it is very important to evaluate any possible toxicological risk of this product. In that case, health authorities should notify consumers about the risk of using these products. This present study was conducted to assess toxicity leaves by an accepted toxicity test, chicken embryotoxicity study.

Fresh tomato leaves were collected on the 60th day, air dried in the shade, powdered and extracted in a Soxhlet apparatus with a mixture of methanol-acetone-water (1:1:2 v/v/v) for 24h. The polar and non-polar compounds will be

extracted by different combinations of these solvents. After that time, the solvents are removed on a rotary evaporator.

Chicken embryotoxicity test is a sensitive, inexpensive and rapid toxicity test, providing information on embryonic lethality, teratogenicity, growth retardation, metabolism as well as systemic toxicity (Kemper & Luepke 1986). Studies have shown that there is a positive correlation between the magnitude of effective concentration in chick embryotoxicity test and those in other system including mammals.

Fertile leghorn eggs were obtained from a breeding farm (Iran farm). Infertile and damaged eggs were discarded. Following sterilization with ethanol, the eggs were drilled. Extraction of plant was injected in 0.1, 1 and 10 mg concentration into the egg yolk. The eggs were closed with paraffin and placed in an incubator at 37.5±0.1°C and 50-60% relative humidity.

The eggs were candled the day after injection and thereafter every 48 h for checking dead embryos. The experiment was terminated on day 20 of incubation. Embryos were removed; decapitated, observed malformation and gross lesions.

Results of our observations are presented in Table 1. Administration of 10 mg extract of leaves per egg caused 100% mortality. In other groups, the major malformations were observed (Fig. 1).

Identifying toxic plants can prevent their poisonings. In this study, the teratogenic potential of tomato has been demonstrated. Children and pregnant women are more susceptible to plant chemical. Active chemical of plants can be transported through the placenta and cause toxicity in fetus (Saad et al. 2006).

Table 1. Effects of Tomato leaves on chicken embryos.

	Control	0.1 mg/egg	1 mg/egg	10 mg/egg
N	10	10	10	10
Survival (%)	90%	80%	70%	0%
Malformations				
Incomplete skull	0	3	3	-
Beak deformities	0	1	3	-
Abnormal eye size	0	1	2	-
Neck /head edema	0	6	7	-
Clubbed feet	0	2	3	-
Hemorrhage and patchy feathers	0	2	2	-



Figure 1. Effects of tomato leaves extract on chicken morphology. Chicken embryos were exposed to extract (1mg/egg). Incomplete skull and beak deformities are shown.

According to some records of North Carolina state university, tomato leaves have an offending chemical that is called tomatine. This alkaloid substance can interfere with cholinergic nerve and cause some serious gastrointestinal distress. Also, toxline database at toxnet have documented leaves and stems of wild tomato with toxic chemicals. The leaves of tomato have active phytochemicals. These leaves are used for controlling mite and they have pesticide efficacy

(Antonious & Snyder 2006). This subject proves that they are toxic or poisonous.

Toxicity of tomato leaves hasn't been studied so well. So far, few compounds such as leucine aminopeptidaseA are recognized in tomato leaves (Narvaez-Vasquez et al. 2008). Plants have complex mixtures terpenes, alkaloids, saponins and other chemicals (Saad et al. 2006). Therefore, chemical analytical techniques and different toxicity tests should be applied on tomato leaves for finding active ingredients and their mechanism.

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