



INHIBITORY EFFECTS OF SOME CHEMICAL PRESERVATIVE IN METAPHASIC STAGES OF FABA BEANS

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Aberration was prominent in metaphase in comparison to anaphase. Metaphysics aberration due to boric acid was stickiness at metaphase and anaphasic aberration bridges at anaphase stage. Some important additives chemicals are used in the storage of food. Sometimes it modifies the taste, color, texture, appearance of food materials. There are harmful and useful aspects of various food additives. Effects of food additives on the chromosomes of *Vicia faba* were observed. Different concentrations of food additive, boric acid were used for 10 hours, resulting a mitoinhibitory effect in root tips and increased chromosomal aberration.

Key words: Faba beans, food additives, mitoinhibition, metaphasic, pesticides.

Introduction

Boric acid, food colors and other food additives affected the genome of plants. *Vicia faba* is commonly known as Faba bean or Broad bean (Bakala). The plants are a nontoxic and chemicals are useful for horse and livestock. Some less developed fruits are more medicinal removing excess toxic juice and help to develop bile¹ and the ripe fruit are useful for skin treatment². It is an edible legume crop commonly consumed by humans and having more nitrogenous component than other species. The other varieties of Faba seeds are very much used as cattle food. Faba bean is also grown for fodder. *Vicia faba* is an upright annual forage legume. Faba bean is a multipurpose crop used for both food and fodder. Fababean is a much delicious food legume in the Mediterranean region, China and Ethiopia. Faba beans are used by human beings after premature harvesting. The dried seeds are cooked, canned, or frozen. Some roasted seeds are used to prepare various types of food and other items like powdered milk and other milk products in India and

other countries. Studies on additives have proved that these can cause cancer. There are so many views on food additives and their other uses. Sometimes food additives are used as microbes repellent. There are several ways to save food from adding preservatives and other additive chemicals, chemicals are mostly soluble in water and used in many types of food materials. These types of chemicals are toxic and lethal having harmful effects on cell metabolism and genetic constitution. Boric acid is a toxic and major used additive having boron which is mixed in cellular plasma and causes deformity. Boric acid is widely used as preservatives in all types of food materials. Boric acid in some amount causes very harmful effects which are not known to general people. Some acts and regulations are also formed to regulate unnecessary harmful uses of these chemicals. Cytotoxic effects due to exposure of additives and pesticides have become a major concern to health because of chemicals broadly used in the preservatives were in the main group of

synthetic chemicals widely used. Various conditional data have proved that pesticides have mitotoxic properties. Many chemicals which are used for insect and weed control are environmental mutagens and pollutants. Among the most widely used additives, some are also of economic important phosphorus, boron chlorine additives. Many additives have a great impact on the ecosystem because of their persistence in the environment. Most chemical compounds cause serious harmful effects in human beings, these compounds accumulate and detectable.

Material and Methods

Faba seeds were soaked in distilled water for 12 hr and allowed to germinate. Counted germinated seeds were treated with four concentrations (i.e. 150,300,550,800ppm of boric acid solutions for five hours. Some faba germinated seeds were treated with distilled water for control in each set. After 5 hr the treated seeds were washed with distilled water for removal of boric acid. Washed seeds were then treated with Carnoy's fixative. Distilled water was used as control. After 24 hr. the root tips were removed from fixative and stored in a cool place and then used for cytological experiments. The root tips were hydrolyzed in 1N HCl at $25 \pm 2^\circ\text{C}$ for 25 minutes for hydrolysis, root tips were washed, treated with water for 6 times to remove HCl. After drying on filter paper, staining of root tips by 2% acetocarmine and the root tips were removed and used for slide preparation. The microscopic assessment was done for mitotic index and chromosomal aberrations for all treatment

and control. Thus, *Vicia faba* based bioassays is normally used because of their large and visible chromosome³. A minimum of 300 cells was observed and mitotic index and chromosomal aberration were calculated.

Results and Discussion

Effect of boric acid on mitotic index of root tip cellson faba bean, the somatic cell consists of 12 chromosomes ($2n = 12$). Mitotic index was recorded to be about 16 in control set there were no chromosomal abnormality. Significant decrease in mitotic index with increasing concentrations of boric acid was recorded. Mitotic indices at different doses of boric acid have been observed (Table 1). There were significant decrease in mitotic index with increase in concentration of boric acid respectively (i.e. 150, 300, 550, 800 ppm). It was clearly observed that boric acid showed mitostatic effect on chromosomal activities.

Effect of boric acid in chromosomal deviation was also shown and abnormalities increased with increasing concentration. Chromotoxic behavior was observed in form of abnormal metaphasic chromosomes. Various types of metaphasic as well as other abnormalities were observed such that stickiness, scattering and precocious movement at metaphase. Unorientation of chromosomes at anaphase and metaphase was also increased in while increasing the concentrations of boric acid. More chromotoxic behavior was analysed with increasing the concentration of boric acid which was also confirmed by which have not any harmful effect when subjected to rigorous examination⁹.

Table.1: Effect of boric acid on *Vicia faba* root meristem (Metaphasic abnormalities)

Treatments Conc. in ppm	Mitotic index	Total no. of cells observed	Total no. of abnormal cells	Scattering	Stickiness	Precocious movement	Bridges	Laggards
Control	14	144	--	--	--	--	--	--
150	11	325	18	0.76	0.85	0.60	0.68	0.52
300	7	316	29	1.56	0.75	0.70	0.88	0.52
550	5	319	28	1.99	0.89	1.70	1.18	1.52
800	2	334	53	2.76	1.55	1.48	1.78	1.92

Safety assessments of food additives are very important because of their genotoxic effects. With the help of conclusion and recent knowledge about food additives, accurate evaluation of proper percentage of food additives is only justified and regulated.

Stickiness may cause lethal effect and chromosomes reflect highly toxic effects and may lead to cell death⁴. The same result of mitotoxicity of other food additives like Ajinomoto on root tips of *Allium cepa* has also been due to failure of movement of chromosomes to their respective poles Laggard chromosomes found and^{5,6} also reported the initiation of laggard chromosomes after the treatment with other food additives⁷. The high concentration of boron creates univalent precocious anaphase movement same type of synaptic mutant was observed as precocious terminalization^{8,9}. Different percentages of boron destroyed microtubules and spindle formation created unorientation and scattering of chromosomes same observation was recorded¹⁰. Use of food additives is very common. Checking food productivity is very important¹¹. DNA and RNA synthesis is also inhibited and disturbed by food additives. The synthesis level of ATP and is decreased. boron also affects the biosynthesis of microtubules and DNA fragments. Abnormality in microtubule biosynthesis due to boron-formed laggards and abnormal anaphase the similar cytotoxic behavior of these food additives was also reported^{12,13}. Imperfect functioning of many types of specific non-histone proteins, implicated in the chromosome involvement which is required for chromatid segregation. Nucleic acid metabolism in cell is disturbed due to boron and causes chromosomal stickiness.

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