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Comparison Between the Effect of Diazinon and Malathion on the Amount of Cholinesterase Enzyme Activity in Spraying Labors at the Agricultural Section in the North of Iran, 2000

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Abstract: In order to study the effects of Diazinon and Malathion on human blood cholinesterase activity, 43 worker's who spared them were examined. Malathion inhibited cholinesterase up to 37.5, 25 and 12.5% in 5, 40 and 20% of subjects, respectively. Diazinon reduced enzyme activity up to 37.5, 25, 12.5% in 20, 25 and 30% of mentioned individuals, respectively. According to achieved data, malathion inhibits human blood cholinesterase activity less than diazinon in the same conditions.

Key words: Malathion, diazinon, tintometric, cholinesterase, activity

INTRODUCTION

Mazadnaran province is located in north Iran. It is one of the fruit production centers of Iran and produces highest quality orchard fruits in Iran. The best quality winter fruits are produced in the Tonekabon city. For many reasons, it is inevitable for the farmers to use many insecticides. Diazinon and Malathion pest controls are the most common used pesticides in this part of the country. Irregular use of insecticides and disregarding health measures or using instructed amounts cause poisoning^[1]. The effects of phosphorus compositions usually appear both in chronic or sever forms^[2]. The severe effects are the most troublesome incidents as well. The sudden and serious attack causes as few disease symptoms as well as stimulation in parasympathetic nerves^[2]. If the contact time is short, the amount of cholinesterase decreases without any specific signs and some times, headache or signs similar to cold are observed, caused by aggregation of acetylcholine esterase in brain receptors^[3]. If different receptors in central nervous system of autonomic nervous system are hurt, large amount of acetylcholin aggregate in brain receptors and cause appearance of serious poisoning symptoms such as cold sweat, high salvia excretion, nausea, vomiting, stomachache, diarrhea, uncontrolled discharge of urea, short brohness, loss of blood pressure and myosis^[3,4].

If the contact time with organophosphate becomes longer, fatigue, shivering and dizziness appear. In addition to the above mentioned symptoms, the occupation of nicotinic receptors by acetylcholin in long time causes

muscle convulsion and adrenalin extract from adrenalin gland that causes chronic uneasiness and the victim gradually loses his mental and decision making abilities and intelligence. These people often suffer from disordered speck, loss of memory and sleeplessness^[3-5].

In places where phosphorated compounds are used as pest control, one of few signs of poisoning are observed in the spraying workers and the residents.

In the Tonekabon city in Mazandaran province, due to variety of agricultural products, large amounts of phosphorus insecticides like Malathion and Diazinon are used to control orchard pests. Diazinon and Malathion, like other organo-phosphorus insecticides inhibit cholinesterase activity and in case of constant exposure, the spraying workers show symptoms of poisoning^[2]. For this reason, the spraying workers and those who were engaged in spraying were studied to show the effects of these insecticides on the cholinesterase enzyme activity in this part of the country.

MATERIALS AND METHODS

There are different methods for measuring the cholinesterase function in blood. Most of these methods need few milliliter blood and for this reason, most spray workers do not show any cooperation^[6]. On the other hand, this could not be done in the filed conditions. Therefore tint metric, as a fast and safe method in filed condition with the capability to compete other methods both in sensitivity and quick results used^[1]. In this method, changes in blood pH are measured. With respect

to the fact that cholinesterase enzyme disintegrates acetilcholin to cholin and acetic acid and changes the environment pH, changes in pH depends on the amount of cholinesterase activity.

To start the work, first a person with no contact with organophosphate insecticides was chosen as witness. The indexes including Bromo Typmol Blue color index and substra indexes were prepared after that and to control them tests were carried out by using 0.01 cc of witness's blood sample and the indexes. The proper function of the indexes was confirmed by this method. To perform the study, 0.01 cc blood sample was taken from witness's finger and poured in a reaction test pipe containing 0.5 cc BTB index. 0.5 cc of substra was added to this sample and the time was noted down. The sample was then placed in special covet and was put inside colorimeter for a color comparison^[7].

The spray workers were tested before and after their job (the hands were thoroughly washed with water and soap and clothes were changed to ensure no insecticide contamination, before and after sample testing). 0.01 cc blood was taken from fingerprint of each worker. The blood samples were directly dropped in reaction pipes containing 0.5 cc BTB index. 0.5 cc substra solution was added to the pipes related to the labors 1 min after the time noted for each pipe. When the color was formed, the witness pipe showed 100% active color. Other pips were placed in the apparatus with 1 min interval and the figure in the disc was read and noted (Colorimeter "Comparator" unit is and standard unit and band with a graded disc that is marked 0-100^[7]).

The number, which was noted, showed amount of cholinesterase enzyme activity.

This study was carried out in 2000 on 43 pest control spray workers in the Tonekabon city who used Malathion and Diazinon pest controls to spray orchard trees.

For control, voluntaries has been chosen which had not contact with any insecticides, they were examined with tintometric method.

RESULTS AND DISCUSSION

This study has been performed in city of Tonekabon at Mazandaran province, north of Iran. Like other organophosphate insecticides, the characteristics of Diazinon and Malathion include inhibition of cholinesterase enzyme activities. The function mechanism of these insecticides work on nervous system and cause inhibition of the enzyme and consequently, signs of cholinstrasic caused by the poison^[2,3,7], Tintometric method which needs a low amount of blood and is easy to

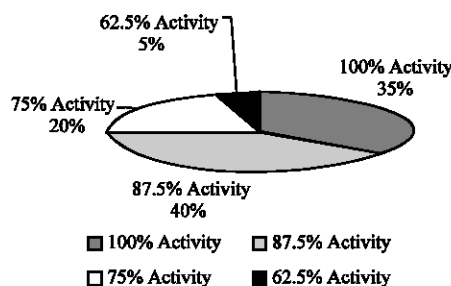


Fig. 1: Cholinesterase activity in workers (Malathion), Tonekabon, 2000

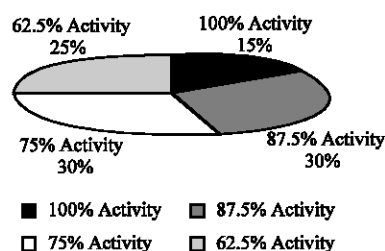


Fig. 2: Cholinesterase activity in worker (Diazinon), Tonekabon, 2000

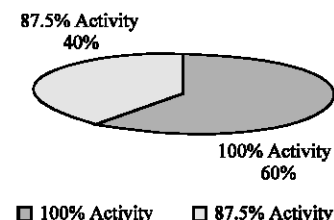


Fig. 3: Cholinesterase activity in controls, Tonekabon, 2000

be used in filed operations was used to measure the amount of cholinesterase in blood of those workers who used Malathion and Diazinon as the pest control spray and person (control)^[7].

Regarding Malathion, the activity of cholinesterase in (25 workers) 5% of workers was about 62.5%. These people suffered from headache, dizziness, nausea and stomachache. However, they recovered after 4 h and their nausea and stomachache were relieved but headache and dizziness remained and were better after 8 h. Amount of cholinesterase in 20% of people was 75%. This group complained from headache and nausea. Forty percent of people showed 87.5% cholinesterase in their blood; however, they did not made any complaints. In 35% of people, the cholinesterase activity amount was normal

(Fig. 1). Regarding Diazinon, (18 workers) 25% of spray workers showed 62.5% cholinesterase activity in their body. Same as Malathion, those who had worked with Diazinon complained from headache, dizziness, nausea, vomiting and stomachache. In number of these people, loss of blood pressure was also observed. The symptoms of poisoning disappeared in these individuals after one day of rest. In 30% of these groups, the amount of cholinesterase activity was 75%. This group complained from headache, nausea and vomiting. After 6 h of rest and no further contact with the pest control, the symptoms disappeared in them. In 30% of workers, the cholinesterase activity measurement showed 87.5% and in 15% of people with 100% cholinesterase activity amount, no problem occurred and they worked in normal way (Fig. 2).

In 60% of person (control) the cholinesterase activity measurement showed 100% and 40% of these people cholinesterase activity measured 87.5% (Fig. 3).

Malathion and Diazinon are among the organophosphate insecticides. Contamination to these pest controls could occur both through touch and respiration. In the city of Tonekabon, which is famous for its high quality orchard fruits in Iran, different pest controls, including phosphorated insecticides are used to improve the quality of product and preserving them against pests. Among the insecticides, Malathion and Diazinon have more application. With respect to vast use of these pesticides, the cholinesterase inhibiting characteristics of both poisons were studied. This study was carried out on 43 spraying workers in the year 2000. The samples were taken in North of Iran during August, which has highest temperature in the year. The spraying operation continued non-stopped from early morning till evening. With respect to high temperature of the region and humidity from afternoon to the evening, the evaporating characteristics of these pest controls, disregarding health measures, not using safety equipment such as uniform, gloves, masks, ... irregular use of insecticides (trees are washed with it) and lack of sufficient care to used the instructed amount, all acted as a factor in decreasing the cholinesterase enzyme activity.

In this connection, a significant decrease was observed in the number of people who had poisoning signs, if the spraying had been performed in early morning or evening, when temperature and humidity was less than daylight and also, when workers used safety equipment in addition to observing safety measures and the amount was used according to the instructions. However, with respect to the results obtained in the study one may say that Malathion is considered a low risk insecticide and if the aforementioned measures are taken, there will be no risk for the spraying workers and those who live in spraying place. For Diazinon, if all measures are taken, with respect to its large scope of function, Diazinon could be used in an optimized form. However, in comparison with Malathion, in case of observing health measures and taking safety instruction into accounts, Malathion is less risky than Diazinon.

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