

EFFECT OF MACHETE HERBICIDE ON LIPID METABOLISM IN ALBINO RAT

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ABSTRACT

The present work investigate the effect of different levels of herbicide Machete (1/4 LD₅₀, 1/2 LD₅₀ and LD₅₀) on body weight and liver & kidney weight as well as total lipid, cholesterol, triglycerides and phospholipids in serum, liver and kidney of albino rats.

In serum and liver, most of the tested parameters were significantly decreased except phospholipid in liver with LD₅₀ treatment. In kidney, most of the parameters were decreased significantly except for the total lipids with LD₅₀, triglycerides with 1/4 LD₅₀ and LD₅₀ and phospholipids with 1/4 LD₅₀ and 1/2 LD₅₀ oral administration of Machete herbicide. Also, a significant decrease recorded in body weight and significant increase in liver and kidney weights.

INTRODUCTION

Machete herbicides cell division inhibitor used as pre-emergence herbicide for the control of annual grasses and certain broad leaved weeds in rice, both seeded and transplanted. It shows selectivity in barley, cotton, peanuts, sugar beet, wheat and several Brassica crops. Activity is dependent on water availability such as rainfall following treatment, overhead irrigation or applications to standing water as in rice culture. It is absorbed mainly by germinating plant shoots, less so by roots; it is translocated throughout the plant, being concentrated in vegetative as opposed to reproductive organs, and is rapidly metabolized (Proc. South Weed Control Conf., 23rd, 1970).

MATERIALS AND METHODS

I- Materials :

Herbicide Machete: N-butoxymethyl-2-chloro-2, 6- dimethyl-acetanilide. It was supplied by Monsanto Co. Acute oral LD₅₀ for rats 2000 mg/kg b.wt.

II- Methods :

Male albino rat (*Rattus norvegicus*) weighing 120- 150 gm were used. The animals were kept for two weeks before the initiation of the test in laboratory for acclimatization. All animals were kept on a fixed well balanced diet with vitamins and minerals added to the drinking water, animals were randomly divided into four groups, each of eight rats; the first group served as control, the second, third and fourth were treated with 500, 1000 and 2000 mg/kg herbicide Machete equal 1/4, 1/2 and LD₅₀, respectively. Each group received 15 oral doses of herbicide with one-day interval between each two consecutive doses. On the day after the last dose, all animals were sacrificed by decapitation. Blood was collected in clean centrifuge tubes, serum was

then separated, harvested and stored at -20°C until use. Tissues were immediately excised and kept deep frozen at -20°C until biochemical analysis were performed. Total lipid were measured according to the colorimetric method of Zoellner and Kirsch (1962), cholesterol was measured according to (Trinder, 1969), triglyceride determination was carried out by the enzymatic colorimetric method of Wahlefeld (1974). Phospho-lipids were measured colorimetrically using molybdate vanadate reaction (Zilversmith *et al.*, 1950). The data were statistically analyzed according to Student's t-test. Differences among groups were considered significant at $P < 0.05$.

RESULTS

Table (1) showed that total lipid contents were significantly decreased in serum with $1/4 \text{ LD}_{50}$ and LD_{50} of Machete, in the liver with $1/4 \text{ LD}_{50}$ and in the kidney with $1/4 \text{ LD}_{50}$ and $1/2 \text{ LD}_{50}$, but there were a non-significant increases in liver with $1/2 \text{ LD}_{50}$ and LD_{50} , a highly significant increase in kidney with LD_{50} Machete.

Table (1) : Effect of oral administration of herbicide Machete on lipid constituents in serum (mg/100 ml) and tissues (mg/g fresh tissue) of albino rats.

Parameters	Organ	Control	Machete treatments		
			$1/4 \text{ LD}_{50}$	$1/2 \text{ LD}_{50}$	LD_{50}
Total lipid	Serum	1160.5±30.5	910.9±36.1***	1112.3±28.1	1030.5±40.7*
	Liver	39.0±1.3	31.1±1.6**	41.8±0.8	42.1±1.7
	Kidney	20.1±0.6	15.1±1.7***	11.7±0.9***	29.5±1.3***
Cholesterol	Serum	376.4±15.5	233.4±6.3***	263.6±8.7***	244.6±4.0***
	Liver	17.7±0.9	15.1±0.6	11.3±4.0***	13.8±0.4**
	Kidney	11.4±0.5	7.4±0.3***	8.8±0.3***	9.9±0.6
Triglyceride	Serum	263.3±12.1	216.3±5.9**	150.5±7.9***	234.7±4.1
	Liver	43.5±2.6	27.4±1.7***	26.9±0.6***	27.8±1.4***
	Kidney	18.9±0.6	23.5±0.5	12.9±0.4***	26.5±1.1***
Phospholipid	Serum	581.6±36.9	102.7±6.1***	62.9±4.9***	408.5±24.9**
	Liver	9.3±0.6	8.3±0.5	9.6±0.6	32.8±2.2***
	Kidney	42.5±2.4	331.4±14.9***	69.2±2.9***	26.7±0.9***

All results are expressed as mean \pm S.E. of 8 rats

* $P < 0.05$ significant

** $P < 0.01$ highly significant

*** $P < 0.001$ very highly significant

Table (2) : Effect of herbicide Machete on body, liver and kidney weight of albino rat.

Parameter	Control	Machete treatment		
		1/4 LD ₅₀	1/2 LD ₅₀	LD ₅₀
Body weight (g)	139.4±1.0	129.0±1.1	119.0±1.2	110.0±1.4
Liver (g)	4.1±0.3	5.6±0.01		7.6±0.1
Kidney (g)	0.83±0.1	1.05±0.01	1.06±0.01	1.07±0.01

Each value represents the mean ± S.E. of 8 rats

* P < 0.05 significant

** P < 0.01 highly significant

Cholesterol levels were significantly decreased in serum with all applied herbicide doses. Also, decreases were noticed in the liver with 1/2 LD₅₀, LD₅₀ and in kidney with 1/4 LD₅₀ and 1/2 LD₅₀.

Triglycerides were significantly decreased in serum with 1/4 LD₅₀ and 1/2 LD₅₀, in liver with all doses used, and in kidney with 1/2 LD₅₀. Triglycerides, however, increased significantly with 1/4 LD₅₀ and LD₅₀.

Phospholipids were significantly decreased in serum with all doses, and in kidney with LD₅₀ only. On the contrary, there was a significant increases in liver at LD₅₀ only, in kidney with 1/4 LD₅₀ and 1/2 LD₅₀ only. Also, data in Table (2) revealed a decreases allover the tested doses used in body weight and an increase in liver and kidney weight comparing to control.

DISCUSSION

Total lipid levels were significantly decreased in serum, liver and kidney with low doses. These results coincide with those reported in serum of rats (Choudhari and Chakrabarti, 1984), pigeons and chickens (Saleh *et al.*, 1989a & b), in liver of rats (Abdel- Raheem *et al.*, 1986 & 1987), and in kidneys of rats (Abdel-Raheem *et al.*, 1986). On the other hand, the total lipid levels were significantly increased in kidney at LD₅₀. These results are inagreement with those obtained in kidney of rats (Abdel-Raheem *et al.*, 1986) and mice (Gupta *et al.*, 1986). In the same time, results previously obtained by El-Mahrouky (1992) agree with the present results.

Abdel-Raheem *et al.* (1987) found a marked increase in lipid content of the brain and kidney with a slight reduction in hepatic lipid after oral administration of sublethal and acute LD₅₀ dose of Ripcord. They also reported that the sublethal doses produced a reduction in serum lipids in male albino rats.

Serum lipase represents a group of enzymes which are capable to hydrolyze triglycerides, deficiency of lipase activity is presumably the one of the reasons for hyperlipidaemia (Thompson and Wootton, 1970). It can be postulated that the decrease in serum total lipids might have resulted from an

increase of serum lipase activity. This increase in the enzyme activity was probably because of herbicide Machete induced damage of the liver cells.

The present results of decreased cholesterol levels in serum, liver and kidney were similar to those obtained in serum of pigeons and chicken (Saleh *et al.*, 1989a & b), rats (Choudhari and Chakrabarti, 1984; Shakoori and Saleem, 1988), and in liver of chickens (Whitehead *et al.*, 1974), rats (Abdel-Raheem *et al.*, 1986), and in the kidney of rats (Abdel-Raheem *et al.*, 1986). Moreover, El-Hennawy *et al.* (1980) reported that administration of low dose of some herbicidal agents to rats resulted in a decrease of the serum cholesterol. This decrease was attributed not only to a hepatotoxic effect, but also to a probable thyroid hyper function.

The triglyceride levels were decreased in serum, liver but not in kidney. Similar results were obtained in rats (Choudhari and Chakrabarti, 1984) and rabbits (Enan *et al.*, 1987), whereas the results of increased triglycerides in kidney were agree with those reported in mice (Gupta *et al.*, 1986). It was reported that the major form of which triglycerides are released from the liver is the very low density lipoprotein (Choudhari and Chakrabarti, 1984).

The treatment with herbicide Machete caused increase in phospholipid concentration of the liver and kidney. These results are similar to those reported in liver and kidney of mice (Gupta *et al.*, 1986). Whereas the serum phospholipid levels with all doses and the kidney with high dose only were significantly decreased. These results are similar to those reported in serum of rats following the administration of DDT (Mitijavila *et al.*, 1981), in pigeons and chickens treated with lannate (Saleh *et al.*, 1989a), and in brain and kidney in rats treated with brodifacoum and diphacinone (Abdel-Raheem *et al.*, 1986). The decrease in serum phospholipids following insecticide or herbicide treatment was believed to be due to reduction in high density lipoprotein (HDL) and low density lipoprotein (LDL) concentration (Choudhari and Chakrabarti, 1984). Shaalan *et al.* (2002) revealed that an oral single dose of 1/4 LD₅₀ flocoumafen anticoagulant rodenticide induced a highly significant increase in plasma cholesterol, insignificant variations in the plasma phospholipids content, significant increases in plasma triglyceride and significant increases in plasma total lipids. Also, our results agree with Shaalan and Asaad (2002) who reported an increase in serum and hepatic contents of total lipids, total cholesterol, triglycerides and phospholipids of animals chronically exposed to cadmium chloride.

Observations on the body weight gain indicated that loss of weight was obvious during the course of the experiment. This results agree with other observation (Dauschies *et al.*, 1988; Leek *et al.*, 1977). This reduction in body weight was accompanied with reduced food intake or loss of appetite.

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**تأثير مييد الحشائش ماشيت على أيض المواد الدهنية في الفأر الأبيض
فاطمة شوقي المحروقي
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تمت دراسة تأثير عدد من الجرعات الفمية المتكررة لمبيد الحشائش ماشيت على مستويات الدهون الكلية والكوليستيرول والجلسريدات الثلاثية والدهون المفسفرة وذلك في مصل وكبد و كلية الفأر الأبيض، وكانت الجرعات تعطى يوم بعد يوم لمدة شهر. أوضحت النتائج إنخفاضا ملحوظا في مستويات الدهون الكلية والكوليستيرول والجلسريدات الثلاثية مع كل الجرعات المستخدمة في الكبد والسيرم. أظهرت النتائج نقصا شديدا لمعظم المكونات في الكلية، بينما سجلت ارتفاعا ملحوظا في الدهون الكلية مع الجرعات العالية والجلسريدات الثلاثية مع الجرعات المنخفضة والعالية والدهون المفسفرة مع الجرعات المختلفة والمتوسطة من المبيد. أيضا مع كل الجرعات المستخدمة، كان هناك نقصا معنويا في وزن الجسم وزيادة معنوية في وزن الكبد والكلية مقارنة بالفئران الغير معاملة. وقد نوقشت النتائج في ضوء الأبحاث المنشورة.