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 LD$_{50}$, 1/2 LD$_{50}$ and LD$_{50}$) 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 LD$_{50}$ treatment. In kidney, most of the parameters were decreased significantly except for the total lipids with LD$_{50}$, triglycerides with 1/4 LD$_{50}$ and LD$_{50}$ and phospholipids with 1/4 LD$_{50}$ and 1/2 LD$_{50}$ 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 LD$_{50}$ 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 LD$_{50}$, 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 LD50 and LD50 of Machete, in the liver with 1/4 LD50 and in the kidney with 1/4 LD50 and 1/2 LD50, but there were no non-significant increases in liver with 1/2 LD50 and LD50, a highly significant increase in kidney with LD50 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.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Organ</th>
<th>Control</th>
<th>Machete treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/4 LD50</td>
</tr>
<tr>
<td>Total lipid</td>
<td>Serum</td>
<td>1160.5±30.5</td>
<td>910.9±36.1***</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
<td>39.0±1.3</td>
<td>31.1±1.6**</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
<td>20.1±0.6</td>
<td>15.1±1.7***</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Serum</td>
<td>376.4±15.5</td>
<td>233.4±6.3***</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
<td>17.7±0.9</td>
<td>15.1±0.6</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
<td>11.4±0.5</td>
<td>7.4±0.3***</td>
</tr>
<tr>
<td>Triglyceride</td>
<td>Serum</td>
<td>263.3±12.1</td>
<td>216.3±5.9**</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
<td>43.5±2.6</td>
<td>27.4±1.7***</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
<td>18.9±0.6</td>
<td>23.5±0.5</td>
</tr>
<tr>
<td>Phospholipid</td>
<td>Serum</td>
<td>581.6±36.9</td>
<td>102.7±6.1***</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
<td>9.3±0.6</td>
<td>8.3±0.5</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
<td>42.5±2.4</td>
<td>331.4±14.9***</td>
</tr>
</tbody>
</table>

All results are expressed as mean ± 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>Machete treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/4 LD&lt;sub&gt;50&lt;/sub&gt;</td>
<td>1/2 LD&lt;sub&gt;50&lt;/sub&gt;</td>
</tr>
<tr>
<td>Body weight (g)</td>
<td>139.4±1.0</td>
<td>129.0±1.1</td>
</tr>
<tr>
<td>Liver (g)</td>
<td>4.1±0.3</td>
<td>5.6±0.01</td>
</tr>
<tr>
<td>Kidney (g)</td>
<td>0.83±0.1</td>
<td>1.05±0.01</td>
</tr>
</tbody>
</table>

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 LD<sub>50</sub>, LD<sub>50</sub> and in kidney with 1/4 LD<sub>50</sub> and 1/2 LD<sub>50</sub>.

Triglycerides were significantly decreased in serum with 1/4 LD<sub>50</sub> and 1/2 LD<sub>50</sub>, in liver with all doses used, and in kidney with 1/2 LD<sub>50</sub>. Triglycerides, however, increased significantly with 1/4 LD<sub>50</sub> and LD<sub>50</sub>.

Phospholipids were significantly decreased in serum with all doses, and in kidney with LD<sub>50</sub> only. On the contrary, there was a significant increase in liver at LD<sub>50</sub> only, in kidney with 1/4 LD<sub>50</sub> and 1/2 LD<sub>50</sub> only. Also, data in Table (2) revealed a decreases all over 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 LD<sub>50</sub>. 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 LD<sub>50</sub> 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 diphacine (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 LD_{50} 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.
REFERENCES


تأثير مبيد الحشائش ماسيت على أيض المواد الدهنية في الفأر الأبيض

فاطمة حمو، مهندسة...

معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقي، الجيزة، مصر.

تتم دراسة تأثير عدد من الجرعات الفنية المتكررة لمبيد الحشائش ماسيت على مستويات الدهون الكلية والكولسترول والجلسريدات الثلاثية والدهون المفسرة وذلك في مصل وكبد كلية الفأر الأبيض، وكانت الجرعات تُعطى يوم بعد يوم لمدة شهر.

أوضحت النتائج انخفاضاً ملحوظاً في مستويات الدهون الكلية والكولسترول والجلسريدات الثلاثية مع كل الجرعات المستخدمة في الكبد والسِرِم.

أظهرت النتائج نقصاً شهيداً لمعظم المكونات في الكبد، بينما سجلت ارتفاعاً ملحوظاً في الدهون مع الجرعات العالية والجلسريدات الثلاثية مع الجرعات المنخفضة والعالية والدهون المفسرة مع الجرعات المختلفة والمتوسطة من المبيد.

أيضًا مع كل الجرعات المستخدمة، كان هناك نقصاً معنويًا في وزن الجسم وزيادة معنوية في وزن الكبد والكليَّة مقارنة بالفتران الفجري معاملة.

وقد نوقشت النتائج في ضوء الأبحاث المشتركة.