PROTECTIVE ROLE OF SELENIUM AND VITAMIN E AGAINST THE DETRIMENTAL EFFECT OF SOME PESTICIDES ON FERTILITY AND SOME HORMONES OF CROSS BREED BULLS AT SHARKIA GOVERNORATE


ABSTRACT

To clarify role of selenium and vitamin E in modulating the adverse effect of deltamethrin and amitraz on some hormones and semen characters, cross breed bulls (n=18; 3-5 years old and 350-400 Kg Bwt) were divided into six groups: group-1 was left without treatment (control), the 2nd and 3rd groups were sprayed with deltamethrin (1/2000) and amitraz (2/1000) three times; one week apart, respectively. The 4th group was injected s/c with 10 ml of viteselen (selenium & vitamin E) once weekly for four successive weeks. The 5th and 6th groups were treated same as the 2nd and 3rd groups but injected with 10 ml of viteselen once weekly during spraying for four successive weeks, respectively. Blood and semen samples were collected for hormonal and semen analysis on Day 1, 15 and 30 post-spray and treatment. There was a significant reduction in T3, T4 and testosterone hormones as well as in sperm cell concentration, motility%, live sperm % but an elevation in total abnormalities at the 1st and 15th days after spraying with deltamethrin and amitraz as comparison with the control. This finding was contradictory to that observed in bulls treated by selenium and vitamin E (group 4, 5 and 6). In conclusion, the spray of cross breed bulls by deltamethrin and amitraz induced many adverse effects on the in thyroid (T3&T4) and testosterone hormones as well as semen picture. These adverse effects can be overcome with selenium and vitamin E combination.

KEY WORDS: Amitraz, Deltamethrin, Testosterone, Thyroxine, Semen.

1. INTRODUCTION

Pesticides are chemicals which are used to control insects, weeds and rodents [1, 23]. Prolonged exposure of animals to pesticides causes toxicities [22], immunosuppression, tumors, reproductive failure and economic losses [4, 7, 20, 27]. Deltamethrin is a pyrethroid pesticide which kills insects on contact, digestion and gives a quick knockdown effect [15, 18, 29]. It has been reported that male rats and bucks, deltamethrin in doses of 1 or 2 mg/ kg bwt for 65 days showed a decrease in the weight of genital organs and sperm motility associated with an increase in the dead sperms% and abnormal spermatozoa%. They also found a decrease in the plasma testosterone level [1, 16, 17, 32]. Histopathological findings of the testicular tissue showed necrosis in the seminiferous tubules with the absence of spermatogonial cells in rats and bucks exposed to deltamethrin for 65 days with complete necroses of the seminiferous tubules and degeneration of leydig cells for 180 days. These were a decrease in the
fertility index of mice dosed amitraz at different concentration [8]. Selenium and vitamin E have a metabolic role in the animal’s body in addition to their antioxidant effects. They are incorporating in the defense against the oxidative stresses upon cells by detoxifying and inhibiting the formation of lipid hydroperoxides [10, 31]. Selenium and vitamin E are not only effective against oxidative damage alone, but also have a synergistic effect when used in combination [10]. The deficiency of selenium induced deterioration of the germinal epithelium of the testes and cessation of spermatogenesis [19].

The present study was designed to evaluate the adverse effect of deltamethrin and amitraz spraying bulls on some hormones (T3, T4 and testosterone) and semen picture in cross breed bulls. In addition, the improvement of the deltamethrin and amitraz sprayed bulls by viteselen treatment to overcome the adverse changes that occur in the fertility of the sprayed bulls.

2. MATERIAL AND METHODS

2.1. Animals:
A total number of 18 adult cross breed bulls 3-5 years old and 350-400 Kg Bwt; kept in a private farm, at Sharkia Governorate; were used in this investigation.

2.2. Chemical and drugs used:
a) Viteselen® [15]: water soluble form was used in the present study. Each 1 ml of the preparation contains: 1.67 mg sodium selenite and 150 mg of Vit. E.
b) Deltamethrin® (Butox): from Intervet Company and the concentration of the spray is: 1/2000.
c) Amitraz®: from El -Nasr Company and the concentration of the spray is: 2/1000.

2.3. Experimental design:

The chosen bulls were divided into six equal groups (three/each). The 1st group was left without spray or treatment as (control). The 2nd and 3rd were sprayed with deltamethrin (1/2000) and amitraz (2/1000) for 3 times with 7 days a part respectively, the 4th not sprayed but was injected s/c with 10 ml of viteselen in one dose weekly for four successive weeks, the 5th and 6th were sprayed with deltamethrin and amitraz for three times with 7 days a part and injected s/c with 10 ml of viteselen at one dose weekly during spraying for four successive weeks.

2.4. Blood samples:
Blood serum samples were taken from all bulls via the jugular vein puncture at days 1, 15 and 30 post spray. The serum was used for determination of T3 and T4 [5] and testosterone by RIA [33].

2.5. Semen samples:
Semen samples were collected from all bulls at days 30 and 60 post-spray by using artificial vagina [18]. Percentages of sperm motility, livability, total abnormalities as well as the sperm cell concentration were estimated [11].

2.6. Statistical analysis:
The obtained data were tabulated statistically analyzed [28].

3. RESULTS

The results of hormonal assay and semen evaluations in control and treated groups were illustrated in tables (1, 2). The obtained results showed that, bulls sprayed with deltamethrin and amitraz (GROUP 2 and 3) revealed a significant reduction in T3, T4 and testosterone at 1 and 15 day post spraying in addition to a significant reduction in sperm cell concentration, motility %, live sperm % and elevation in total abnormalities in comparison to the control group (GROUP 1). Bulls injected only with viteselen (GROUP 4) showed a significant increase in T3, T4 and
Viteselen effects on crossbreed bulls

testosterone hormone at 1 and 15 day post treatment with a significant increase in sperm cell concentration, progressive motility and live sperm as well as decrease in total abnormality percentage at 1 and 30 days post treatment in comparison to the control group (GROUP 1). Bulls sprayed with deltamethrin and amitraz and injected with viteselen (GROUP 5 and 6) showed a significant increase in T3, T4 and testosterone hormone on the 1 and 15 day post treatment with significant increase in sperm cell concentration, progressive motility and live sperms as well as a decrease in total abnormality percentage on 1 and 30 days post treatment, compared to the control group.

Table 1: Effect of deltamethrin, amitraz and viteselen on some hormones in bulls

<table>
<thead>
<tr>
<th>Groups</th>
<th>Days Post spray</th>
<th>T3 (ng/ml)</th>
<th>T4 (ng/ml)</th>
<th>Testosterone (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>183.17±5.48</td>
<td>4.69±0.42</td>
<td>0.87±0.13</td>
</tr>
<tr>
<td>Deltamethrin</td>
<td>(1:2000)</td>
<td>170.21±4.21*</td>
<td>1.98±0.31*</td>
<td>0.61±0.10*</td>
</tr>
<tr>
<td>Amitraz</td>
<td>1</td>
<td>172.91±5.12**</td>
<td>1.93±0.28**</td>
<td>0.45±0.09**</td>
</tr>
<tr>
<td>Viteselen</td>
<td></td>
<td>193.29±4.14**</td>
<td>6.47±0.49*</td>
<td>0.83±0.12**</td>
</tr>
<tr>
<td>Deltamethrin &amp; viteselen</td>
<td>1</td>
<td>187.38±2.87</td>
<td>5.09±0.48</td>
<td>0.67±0.15</td>
</tr>
<tr>
<td>Amitraz &amp; Viteselen</td>
<td>1</td>
<td>187.94±2.69</td>
<td>4.89±0.58</td>
<td>0.65±0.10</td>
</tr>
</tbody>
</table>

*Significant at P < 0.05.  ** Significant at P < 0.01.

Table 2: Effect of deltamethrin, amitraz and viteselen treatment on Semen picture in bulls

<table>
<thead>
<tr>
<th>Groups</th>
<th>Days Post spray</th>
<th>sperm cell conc. (x10^6)</th>
<th>Sperm motility %</th>
<th>Live sperm %</th>
<th>Abnormality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>63.14±1.46</td>
<td>80.15±0.49</td>
<td>89.03±0.91</td>
<td>15.05±0.17</td>
</tr>
<tr>
<td>Deltamethrin</td>
<td>(1:2000)</td>
<td>54.18±0.72*</td>
<td>71.27±0.92*</td>
<td>83.13±0.57*</td>
<td>25.03±0.92*</td>
</tr>
<tr>
<td>Amitraz</td>
<td>1</td>
<td>52.71±0.63**</td>
<td>70.38±0.89**</td>
<td>82.22±1.05**</td>
<td>23.06±0.75**</td>
</tr>
<tr>
<td>Viteselen</td>
<td></td>
<td>65.28±0.48*</td>
<td>87.13±0.99%</td>
<td>91.17±0.16%</td>
<td>8.05±0.42%</td>
</tr>
<tr>
<td>Deltamethrin &amp; viteselen</td>
<td>1</td>
<td>60.46±1.15</td>
<td>82.08±0.57</td>
<td>88.45±0.79</td>
<td>10.05±0.78</td>
</tr>
<tr>
<td>Amitraz &amp; Viteselen</td>
<td>1</td>
<td>62.03±1.91</td>
<td>82.21±0.82</td>
<td>87.16±0.82</td>
<td>12.03±0.46</td>
</tr>
</tbody>
</table>

*Significant at P < 0.05.  ** Significant at P < 0.01.
4. DISCUSSION

The present study denoted that the, cross breed bulls sprayed with deltamethrin and amitraz revealed a significant decrease in thyroid (T3&T4) and testosterone on the day 1 and day 15 post spraying. A finding which come in accordance with that observed in bovine [25], rabbits [12], rats [6] and mice [8]. These finding might be explained on the fact that hypothyroidism caused by the exposure to insecticides induces reduction in secretion of gonadotrophic releasing hormones and testosterone in rats [26].

In the present study, there was a significant increase in the mean values of thyroid hormones (T3&T4) and testosterone in cross breed bull on Day 1 and day 15 post-treatment with viteselen (selenium & vitamin E) and this agreed with that obtained in goats [3]. Selenium acts as selenocysteine; an amino acid that is present in several enzymes; which is a co-factor for hepatic enzyme type 1, 5-Iodothyronine-deiodinase and increases the ability of deiodination of T3&T4 and increases the ability to degrade rT3 [13]. In addition, the testicular cholesterol content is the main precursor for the biosynthesis of testosterone hormone by the Leydig cells of the testis was increased in rabbits treated with selenium and vitamin E [2].

Concerning the semen picture, the obtained results revealed significant reduction in the sperm cell concentration, sperm motility, and live sperms with significant elevation in sperm abnormalities at day, 1 and day, 30 posts spraying by deltamethrin and amitraz. These findings can in agreement with that obtained in rabbits [12, 16] in rats [16, 30] and in mice [8]. The reduction in number of spermatozoa and motility in the present study may be due to the spray by deltamethrin or amitraz insecticide caused testicular lesions represented by moderate to severe degenerative changes of spermatogonial cells and partial arrest of spermatogenesis as showing in some previous reports [14, 35]. Moreover, Holsberger and Cooke [20] recorded that the decrease in sperm cell concentration and motility% in rats may be attributed to the disruption of spermatogenesis by deltamethrin and amitraz which is preceded and caused by the impairment of the leydig cells function and the resultant drop in testosterone hormone in the testis of rats. Vitamin E and selenium increases the level of testicular zinc content [2] and zinc play an important role in establishment and maintenance of fertility due to enhancement of testosterone retention within the testes [24].

From the present work, it can be concluded that the spray of bulls by amitraz and deltamethrin induced many reversible alterations in thyroid hormone (T3&T4), testosterone and the semen picture in these bulls, which returned to their normal values by viteselen (selenium and vitamin-E) injections during spraying. Viteselen minimize or reduce the alterations in fertility and hormonal changes induced by deltamethrin and amitraz.

5. REFERENCES


الدور الوقائي للسيلينيوم وفيتامين هـ ضد التأثير الضار الناتج عن الرش ببعض المبيدات الحشرية على الخصوبة وما بعد الرش ببعض الهرمونات في طلائق الأبقار الخليط في محافظة الشرقية

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الملخص العربي

صممت هذه الدراسة لقياس الدور الوقائي لخلط السيلينيوم و فيتامين هـ على الحماية ضد التأثير الضار الناتج عن الرش بالدلتامثرين والاميتراز على من خلال مستوى الهرمونات وخصائص السائل المنوي في طلائق الأبقار على مدى فترة الرش. تبين لنا من تلك الدراسة أن الدلتامثرين، الاميتراز والفيتامينات أحدثت بعض التغييرات في الهرمونات وصورة السائل المنوي وتشير النتائج إلى أن استعمال الدلتامثرين والاميتراز في رش طلائق الأبقار الخليط أدى إلى وجود نقص معنوي في مستوى هرمونات الغدة الدرقية وهرمون الذكورة عند اليوم الأول والعش عشر بعد الرش بالدلتامثرين والاميتراز في المجموعتين الثانوية والثالثة إضافة إلى نقص معنوي في تركيز الهرمونات المنوية. معدل الحركة وعدد الهرمونات المنوية الحية كما أدى إلى زيادة نسبة العيوب الشكلية في الهرمونات المنوية بالمجموعة الضابطة. بينما استعمال مخلوط السيلينيوم وفيتامين هـ في المجموعات المعالجة (الرابعة، الخامسة، السادسة) أدى إلى تحسن في تركيز الهرمونات الغدة الدرقية والتدسيرون كما أدى إلى زيادة معنوية في تركيز الهرمونات المنوية ومعدل الحركة وعدد الهرمونات المنوية الحية إضافة إلى نقص معنوي في نسبة العيوب الشكلية الكلية في الهرمونات المنوية بالمقارنة بالمجموعة الضابطة. تستخلص من هذه الدراسة أن الرش بالدلتامثرين والاميتراز لهما تأثيرات ضارة على هرمونات الغدة الدرقية وهرمون الذكورة وتؤثر على خصائص السائل المنوي في طلائق الأبقار الخليط ولكن باستخدام خليط السيلينيوم وفيتامين هـ أدى إلى تقليل تلك التأثيرات، لذلك ينصح باستخدام خليط السيلينيوم وفيتامين هـ في مزارع الأبقار أثناء الرش بالدلتامثرين والاميتراز.