

## Effects of Qat Water Extract Combined with Sublethal Dose of Cypermethrin on Fetuses Body Weight and Length of Pregnant Mice

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**ABSTRACT:** The effect of Qat water extract and sublethal concentration of Cypermethrin as active ingredient (A.I.) or formulated type (F) alone or in combination with Qat was evaluated on mice fetuses body weight and length. Female mice were exposed to these treatments during 6<sup>th</sup> – 18<sup>th</sup> day of gestation. The results showed that there were significant reduction in mice fetuses body weight and length due to the administration of Qat extract alone, Cypermethrin alone, or the combinations of 5g/kg Qat extract with the respective sublethal dose of 1/10<sup>th</sup> LD<sub>50</sub> (25 mg/kg) of either insecticide type. The formulated Cypermethrin (F) was more effective than its active ingredient type in all experiments, where the tested commercial formulation of Cypermethrin (Cymbush® 10 % E.C.) showed a dramatic significant reduction in the fetuses body weight and length compared with the control. The reduction of body weight and length was higher in case of Qat extract (5g/kg) + 1/10<sup>th</sup> LD<sub>50</sub> of Cypermethrin formulation treatment with a mean reduction percentage of 40.00% of fetuses body weight and 59.31% of fetuses body length, while the mean reduction percentages for Cypermethrin (A.I.) were 36.24% and 51.91%, respectively. Qat extract alone had a reduction percentage of 15.07% of fetuses body weight. It could be concluded that there is might be high a risk for those pregnant women who consume Qat.

**Keywords:** Qat (Khat) extract, Cypermethrin, combinations, sublethal dose, fetuses body weight and length of the pregnant mice

## INTRODUCTION

Qat, *Catha edulis* (Forssk.), is one of the widely freshly edible crops in Yemen and many African countries including Somalia, Kenya, Ethiopia, Djibouti, Madagascar, Tanzania and Uganda. The Qat plant top leaves and shoots are the main consumed parts for the habitual chewing of Qat and Qat is being used for centuries as a stimulant (Krikorian, 1984 and Kennedy, 1987). Low birth weight is a contributing risk factor in both prenatal and infant mortality among Qat chewers during pregnancy. Qat can affect fetal development during pregnancy via placental insufficiency, which could be explained by the extremely high blood pressure observed in these pregnant women (Dhaifalah and Santavy, 2004) and as a consequence, on fetal growth and development (El-Shoura *et al.*, 1995 and Mwenda *et al.*, 2003).

Pesticide products are composed of active and inert ingredients. The active ingredients are chemicals designed to kill, repel or suppress the pest. The inert ingredients are those added as solvents, emulsifiers and fillers to the pesticide product. The inert ingredients are defined as materials intentionally added to active ingredients during formulation of an end-use product to improve

the physical characteristics of the commercial formulated pesticide. In fact, inert ingredients used in pesticides may have biological activity and some can be highly toxic (US EPA, 2012).

Due to the highly economic importance of Qat as a cash crop, its producers are always keen to use pesticides heavily for protection from various pests to ensure healthy Qat foliage for fresh consumption. It has been estimated that 70% of pesticides that are imported to Yemen used on Qat trees (Al-Gahashm and Mogaahed, 1988 and Apps *et al.*, 2011). The unscientific and random use of pesticides, especially on Qat is one of the great dangers threatening human and environment in Yemen (Thabet, 1993). Moreover, there is a concern that people who consume Qat are at high risk of pesticide residues exposure. Residues of these pesticides and related toxic chemicals retard in adipose tissue are not kept inert, but are slowly released where they cause adverse health effects, immunological depression and mutagenic, teratogenic and carcinogenic effects (Thabet, 2002a). Studies conducted in Yemen indicated that some globally and nationally banned pesticides were still used on Qat trees. However, it has been reported that some banned and restricted pesticides are still available in pesticide retail shops and used by Yemeni Qat farmers. Chemical toxicity of pesticide residues is a serious problem in Qat production and may present immediate danger to the user if applied improperly or without sufficient knowledge of these toxic materials and their effects (Thabet, 2002b).

Qat causes various social, economic and health problems. Pesticides used in the developing countries still include many of the already banned or restricted insecticides such as Cypermethrin insecticide, which is banned in Yemen due to its cytotoxicity potential. Pesticides used on Qat trees in Yemen still include many of such banned or restricted ones. The possibility of foliage contamination with Cypermethrin residues is quite expected. The present investigation is devoted to investigate the effect of Qat water extract alone or combined with Cypermethrin insecticide as active ingredient or its commercial formulation on fetuses body weight and length of the pregnant mice as mammalian tested animal.

## **MATERIALS AND METHODS**

### **Tested Materials**

#### **Qat Plant Samples**

The fresh samples of stem tops and leaves of Qat, *Catha edulis* (Forsskal) were obtained from special farm located at Dulaa Hamdan, Sanaa Governorate, Yemen. The original Qat vegetation was kept away from any pesticides application.

#### **Pesticide Used**

Cypermethrin (98% active ingredient) (Technical) (A.I) used in this study was obtained from Dimminico Ltd, Switzerland and the commercial formulation (Cymbush<sup>®</sup> 10% E.C.) (F) was obtained from Syngenta, Basel, Switzerland. Acute oral toxicity (LD<sub>50</sub>) for mice (250 mg/kg) was taken in consideration according to US EPA (1989) and Ray (1991).

## **Treatment and Care of Animals**

### **Experimental Animals**

Male and female Swiss albino mice strain *Mus musculus domestics* were used for this study as they were ready for mating. They were obtained from Faculty of Agriculture, Sana'a University, Yemen. Virgin female and male mice were housed separately in plastic cages, each cage contained five female mice. Mice were fed on standard diet in plates containing protein, carbohydrates, fibers, vitamins and minerals (Aly, 2000). The animals were provided with tap water *ad libitum* and they were left for one week for adaptation under the laboratory environment before experimentation. Throughout the experimental period, care and cleaning were important for maintaining the animals in a normal healthy state. The experiment was carried out in the laboratory of Pesticides Chemistry, Plant Protection Department, Faculty of Agriculture, Sanaa University, Yemen.

### **Animal Mating**

Two females (7- 8 weeks old) with an average weight of  $30\pm 2$  g were provided with one sexually mature male of the same strain. They were placed in the cages at the appropriate time of estrus cycle. The presence of the sperms in the vaginal smear was considered as zero day of gestation. This procedure was carried out from 5 p.m to 9 a.m daily. Copulation was ascertained by the presence of a vaginal plug. The presence of a vaginal plug was counted as zero day of gestation (Brittebo *et al.*, 1979; Anderson *et al.*, 1989; Mark *et al.*, 2001). Pregnant females were separated and housed in groups for treatment.

### **Preparation of Qat Extract**

The fresh samples of stem tops and leaves of Qat, *Catha edulis* (Forssk.) were obtained from special farm (Dulaa Hamdan), Sanaa Governorate. The original Qat vegetation was kept away from any pesticide application. Qat stem tops and leaves were homogenized in distilled water (D.W.) using homogenizer for one hour. Then, the suspension was filtered through a Whatman No. 1 filter paper using a 5 cm diameter Buchner funnel. The crude extract of Qat was then transferred to a 50 ml glass vial and stored as a stock solution at  $-20^{\circ}\text{C}$  until used.

### **Experimental Design**

A standard volume of 0.5 ml of Qat extract (5g/kg) alone or combined with another 0.5 ml of  $1/10^{\text{th}}\text{LD}_{50}$  (25 mg/kg) Cypermethrin insecticide active ingredient or its formulation were used to study their effect on body weight and length of fetuses of mice. Doses were calculated according to individual body weight on 6<sup>th</sup> day of gestation. Studies involving short-term administration generally include exposing the pregnant female mice to the tested Qat extract alone or its combinations with both types of the tested insecticide during the period of organogenesis which is thought to be the period of maximum sensitivity to teratogenic agents (Tuchmann, 1965). The groups were treated from the day six of pregnancy and then every day until the 15<sup>th</sup> day after gestation (total of 10 doses) as follows:

### **A: Control Groups**

Two control groups for each treatment were used; each group contained 5 pregnant females mice treated orally with the same volume of distilled water (as control for formulated [F] insecticide) or corn oil (for active ingredient [A.I.] insecticide).

### **B: Treated Groups**

**Group (1):** 15 pregnant female mice were treated with Qat extract alone or its combination with Cypermethrin active ingredient (A.I.) insecticide according to the following regimens:

Treatment 1 (T1): 5 pregnant female mice were treated with 0.5 ml of the concentration of 5 g/kg Qat extract alone.

Treatment 2 (T2): 5 pregnant female mice were treated with 1/10<sup>th</sup> LD<sub>50</sub> (25 mg/kg) Cypermethrin (A.I.) insecticide alone.

Treatment 3 (T3): 5 pregnant female mice were treated with 5 g/kg Qat extract + 1/10<sup>th</sup> LD<sub>50</sub> (25 mg/kg) Cypermethrin (A.I.) insecticide.

**Group (2):** 15 pregnant female mice were treated with Qat extract alone or its combination with Cypermethrin formulation (F) insecticide according to the following regimens:

Treatment 1 (T1): 5 pregnant female mice treated with 5 g/kg Qat extract alone.

Treatment 2 (T2): 5 pregnant female mice treated with 1/10<sup>th</sup> LD<sub>50</sub> (25 mg/kg) Cypermethrin formulated insecticide (F) alone.

Treatment 3 (T3): 5 pregnant female mice treated with the mixture of 5 g/kg Qat extract + 1/10<sup>th</sup> LD<sub>50</sub> (25 mg/kg) Cypermethrin (F) insecticide.

### **Weights and Lengths of Fetuses**

Controls and treated pregnant female mice in each group were sacrificed 18 days of gestation by inhalation of ether. The abdominal skin was opened and the uterine horns were exteriorized through a midline abdominal incision. Each fetuses in right horn position (R.H.) and left horn position (L.H.) was removed from the uterus. Fetuses were examined for any external malformation, then the weight, length of fetuses body and reduction percentage of weight and length were recorded.

### **Statistical Analysis**

Data were analyzed using IBM Statistic Package Version 21. All data are expressed as mean ± standard deviation (SD) (Sendecor, 1987). Reduction percentage of weight and length were calculated as follows:

$$\text{Reduction \%} = \frac{\text{Average of control} - \text{Average of treatment}}{\text{Average of control}} \times 100$$

## **RESULTS AND DISCUSSION**

### **Effect of Qat water extract alone or in combination with Cypermethrin (A.I) on fetuses body weight and length**

The effect of the administration of either 5 g/kg Qat extract alone, 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin (A.I.) insecticide alone or 5 g/kg Qat extract combined with 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin on the fetuses body weight and length is shown in

Table (1) and Figure (1 and 2). The mean values ( $\pm$ S.D.) of fetuses body weight resulted from the treatment of 5 g/kg Qat extract alone were 1.52 g ( $\pm$  0.03) with a reduction percentage of 14.12% in right horn (R.H) and 1.44 g ( $\pm$  0.03) with reduction percentage of 14.29% in left horn (L.H). The recorded means ( $\pm$  S.D.) for fetuses body length were 3.8 $\pm$ 0.22 cm with a reduction of 3.55% in R.H and 4.0 $\pm$ 0.32 cm with a reduction percentage of 4.08% in L.H for fetuses body length.

The mean of fetuses body weight resulted from the treatment of 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin (A.I.) insecticide alone was 1.29 $\pm$ 0.12 g with a reduction percentage of 27.12% in R.H and 1.23 $\pm$ 0.12 g with a reduction percentage of 26.79% in L.H. Meanwhile, the recorded mean of the fetuses body length was 2.40 $\pm$ 0.20 cm with a reduction percentage of 39.09% in R.H and 2.50 $\pm$ 0.15 cm with a reduction percentage of 40.05% in L.H.

**Table (1). Reduction percentages in fetuses body weight and length after treatment with Qat extract / Cypermethrin (A.I.) combinations during day 6<sup>th</sup> to 18<sup>th</sup> of gestation**

Treatment	Fetuses Body Weight (g)		Fetuses Length (cm)	
	R.H*	L.H	R.H	L.H
Control group	1.77 $\pm$ 0.04 <sup>a***</sup>	1.68 $\pm$ 0.76 <sup>a</sup>	3.94 $\pm$ 0.15 <sup>e</sup>	4.17 $\pm$ 0.27 <sup>e</sup>
5 g/Kg Qat Extract Alone	1.52 $\pm$ 0.03 <sup>b</sup>	1.44 $\pm$ 0.03 <sup>b</sup>	3.80 $\pm$ 0.22 <sup>f</sup>	4.00 $\pm$ 0.32 <sup>f</sup>
Reduction %**	14.12	14.29	3.55	4.08
Mean of Reduction%	14.21		3.82	
	R.H	L.H	R.H	L.H
1/10 <sup>th</sup> LD <sub>50</sub> Cypermethrin Alone	1.29 $\pm$ 0.12 <sup>c</sup>	1.23 $\pm$ 0.12 <sup>c</sup>	2.40 $\pm$ 0.20 <sup>g</sup>	2.50 $\pm$ 0.15 <sup>g</sup>
Reduction %	27.12	26.79	39.09	40.05
Mean of Reduction %	26.96		39.57	
	R.H	L.H	R.H	L.H
5 g/Kg Qat Extract +1/10 <sup>th</sup> LD <sub>50</sub> Cypermethrin	1.13 $\pm$ 0.06 <sup>d</sup>	1.07 $\pm$ 0.10 <sup>d</sup>	1.90 $\pm$ 0.16 <sup>h</sup>	2.00 $\pm$ 0.24 <sup>h</sup>
Reduction%	36.16	36.31	51.78	52.04
Mean of Reduction%	36.24		51.91	
L.S.D.	0.043	0.057	0.218	0.308

(A.I.) = Active Ingredient \*R.H. = right horn position and L.H. = left horn position

\*\* Reduction percentage as compared with control

\*\*\* (M  $\pm$  S.D.) = Mean of 5 replicates  $\pm$  Standard Deviation and these mean values having the same letter(s) are not significantly different from each other (P < 0.05).

L.S.D. = Least Significant Difference for treatment

The results proved that there was more reduction occurred in both weight and length of fetuses in the group which treated with 5 g/kg Qat extract combined with 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin where the mean fetuses body weight were 1.13  $\pm$ 0.06 g with a reduction percentage of 36.16% in R.H and 1.07  $\pm$ 0.10 g with a reduction percentage of 36.31% in L.H. The means of fetuses body length were 1.90 $\pm$ 0.16 cm (with reduction of 51.78%) in R.H and 2.00 $\pm$ 0.24 cm (with a reduction of 52.04%) in L.H. Means of reduction percentages of fetuses body weight were 14.21%, 26.96% and 36.24% and the means of fetuses body length were 3.82%, 39.57% and 51.91% for the different running treatments (5 g/kg Qat extract alone, 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin alone and 5 g/kg

Qat extract combined with  $1/10^{\text{th}}$  LD<sub>50</sub> Cypermethrin, respectively) as compared with the control treatment.

### Effect of Qat water extract in combination with Cypermethrin (F) on fetuses body weight and length

Results in the Table (2) and Figure (1) clearly indicate that there were significant differences between the mean values of the fetuses body weight and length compared with the control as also photographed and illustrated in Plate 1.

The mean values of fetuses body weight due to the administration of 5 g/kg Qat extract alone were  $1.50 \pm 0.02$  g giving a reduction percentage of 15.25% in R.H and  $1.43 \pm 0.02$  g (with 14.88% reduction) in L.H. Meanwhile, the means of fetuses body length were  $3.80 \pm 0.16$  cm (with 3.55% reduction) in R.H and  $4.00 \pm 0.31$  cm (with 4.08% reduction) in L.H.

**Table (2). Reduction percentages in fetuses body weight and length after treatment with Qat extract/ Cypermethrin (F) combinations during day 6<sup>th</sup> to 18<sup>th</sup> of gestation**

Treatment	Fetuses Body Weight (g)		Fetuses Length (cm)	
	R.H*	L.H	R.H	L.H
Control group	$1.77 \pm 0.04^{a***}$	$1.68 \pm 0.06^a$	$3.94 \pm 0.15^e$	$4.17 \pm 0.27^e$
5 g/Kg Qat Extract Alone	$1.50 \pm 0.02^b$	$1.43 \pm 0.02^b$	$3.80 \pm 0.16^f$	$4.00 \pm 0.31^f$
Reduction %**	15.25	14.88	3.55	4.08
Mean of Reduction %	15.07		3.82	
	R.H	L.H	R.H	L.H
$1/10^{\text{th}}$ LD <sub>50</sub> Cypermethrin alone	$1.15 \pm 0.01^c$	$1.10 \pm 0.02^c$	$2.00 \pm 0.16^g$	$2.10 \pm 0.10^g$
Reduction%	35.03	34.52	49.24	49.64
Mean of Reduction%	34.78		49.44	
	R.H	L.H	R.H	L.H
5 g/kg Qat Extract + $1/10^{\text{th}}$ LD <sub>50</sub> Cypermethrin	$1.06 \pm 0.02^d$	$1.01 \pm 0.06^d$	$1.60 \pm 0.16^h$	$1.70 \pm 0.17^h$
Reduction%	40.11	39.88	59.39	59.23
Mean of Reduction %	40.00		59.31	
L.S.D.	0.037	0.064	0.218	0.366

\*R.H. = right horn position and L.H. = left horn position

\*\* Reduction percentage as compared with control

\*\*\* Mean of 5 replicates  $\pm$  Standard Deviation and these mean values having the same letter(s) are not significantly different from each other ( $P < 0.05$ ).

L.S.D. = Least Significant Difference for treatment

The estimated fetuses body weight means in treatment with Cypermethrin formulation insecticide (F) alone ( $1/10^{\text{th}}$  LD<sub>50</sub>) alone were  $1.15 \pm 0.01$ g with a reduction percentage of 35.03% in R.H and  $1.10 \pm 0.02$  g with a reduction percentage of 34.52% for L.H. The fetuses body length means were  $2.00 \pm 0.16$  cm (with reduction of 49.24%) in R.H and  $2.10 \pm 0.10$  cm (with reduction of 49.64%) in L.H. The results proved that there were more reduction in the body weight and length of fetuses especially in this group that has been treated with 5 g/kg Qat extract combined with  $1/10^{\text{th}}$  LD<sub>50</sub> of Cypermethrin (Cymbush® 10% E.C.). The fetuses body weight means were  $1.06 \pm 0.02$  g showing the highest reduction percentage of 40.11% in R.H and  $1.01 \pm 0.06$  g

with a higher reduction percentage of 39.88% in L.H. The means of fetuses body length were  $1.60 \pm 0.16$  cm showing the highest reduction (59.39%) in R.H and  $1.70 \pm 0.17$  cm with a higher reduction (59.23%) in L.H. Means of reduction percentages were 15.07%, 34.78% and 40% of fetuses body weight and 3.82%, 49.44% and 59.31% of fetuses body length in the following treatments: 5 g/Kg Qat extract alone,  $1/10^{\text{th}}$  LD<sub>50</sub> Cypermethrin (F.) alone and 5 g/Kg Qat extract combined with  $1/10^{\text{th}}$  LD<sub>50</sub> Cypermethrin (F.), respectively as compared with the control. Cypermethrin formulation was more effective than the active ingredient insecticide in all experiments where Cypermethrin formulation showed a dramatic significant reduction in the fetuses body weight and length compared with the control. Our results are in line with those reported by El-Sebae *et al.* (1978) who found that the formulated insecticides were higher in their mammalian toxicity than the corresponding technical materials. Also, El-Tawil and Marzouk (2015) concluded that the acute toxicities of these commercial pesticide formulations seemed to be more toxic than their reported toxicities which based on active ingredients.

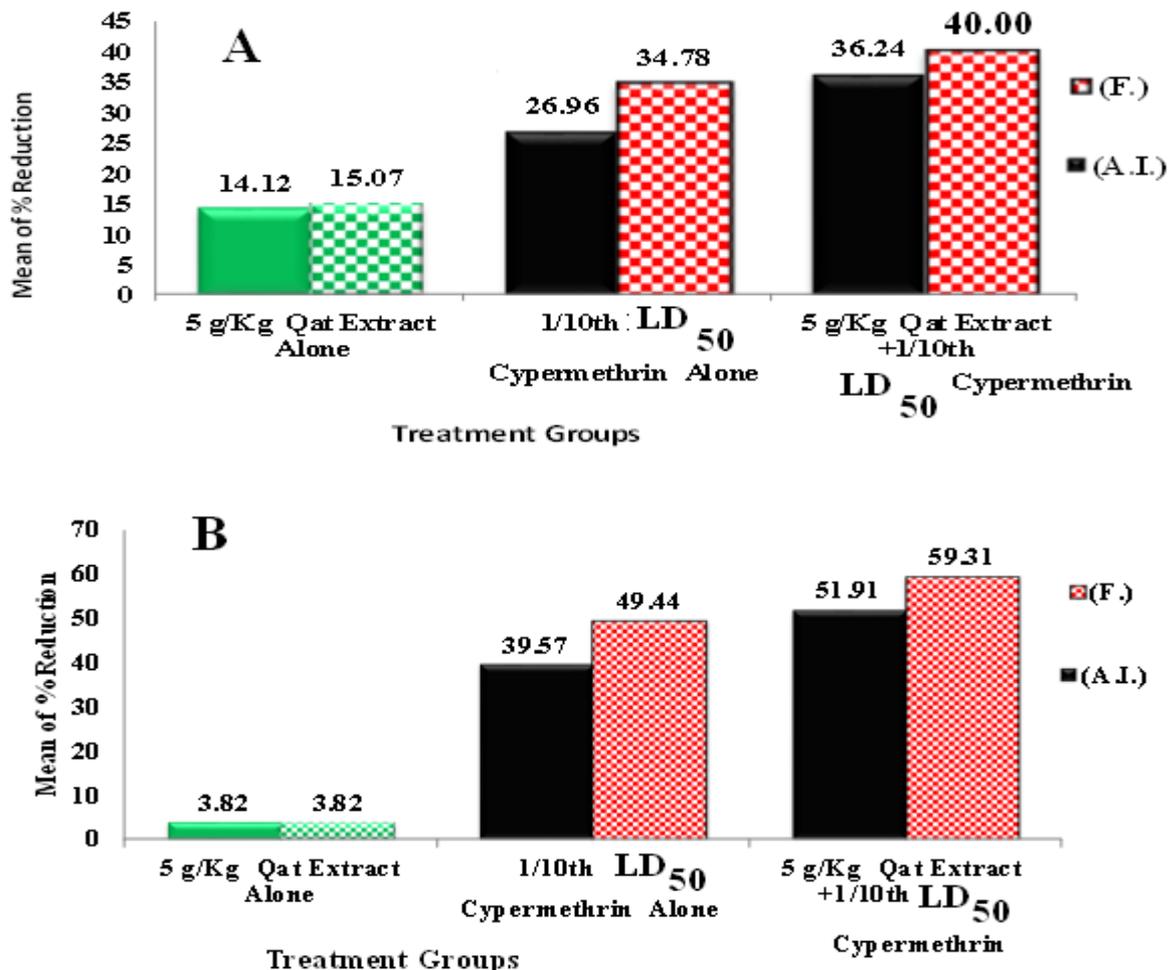


Figure (1). A= mean reduction% of fetuses body weight after treatment with Qat extract/ Cypermethrin combinations from 6<sup>th</sup> to 18<sup>th</sup> Days of Gestation and B= mean reduction% of fetuses body length after treatment with Qat extract/ Cypermethrin combinations from 6<sup>th</sup> to 18<sup>th</sup> day of gestation.



Photo (1):  
Distilled Water  
(Control)

Photo (2): Corn  
Oil (Control)

Photo (3): 5 g/kg  
Qat extract  
alone.

Photo (4):  
1/10<sup>th</sup> LD<sub>50</sub> of  
Cymbush<sup>®</sup> (10  
% EC) alone

Photo (5): 5 g/kg  
Qat extract +  
1/10<sup>th</sup> LD<sub>50</sub>  
Cymbush<sup>®</sup> (10 %  
EC)

**Plate (1). Variations of fetuses obtained from the pregnant mice treated with distilled water or corn oil (control) and the different administered treatments during Day 6<sup>th</sup> to 18<sup>th</sup> of gestation**

Photos (1 and 2): Body weight in fetuses from pregnant mice treated with distilled water or corn oil during day 6 to 18<sup>th</sup> of Gestation, Photo (3): Loss in body weight in fetuses from mice treated with 5 g/Kg Qat extract alone during day 6 to 18<sup>th</sup> of Gestation and Photo (4): Loss in body weight in fetuses from mice after treated with 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin (F.) alone and Photo (5): 5 g/kg Qat extract + 1/10<sup>th</sup> LD<sub>50</sub> Cypermethrin (F.) during day 6 to 18<sup>th</sup> of gestation.

The present study in mice was not preceded in the literature and it could be designed for the first time to examine the effects of Cypermethrin active ingredients and its commercial formulation on fetuses body weight and length of the pregnant mice during day 6-18 of gestation. Herein, Cypermethrin was applied as formulated products that contain the active ingredient, which has the killing power, and other ingredients that usually called inert ingredients, or inerts; these inerts have a variety of functions such as preventing caking or foaming, extending product shelf-life, helping the product stick to the surface of leaves and soil, spread over surfaces, allowing herbicides to penetrate plants, preventing clogging during application or making ingredients compatible (NPIC, 2011).

Knowing that the levels tested in our study of Qat resembles the low level of normal consumption and that the type and level of insecticide residues are already found in reality in the treated Qat fields in Yemen, then the adverse effects obtained in the teratogenic study should be used as alarming, especially to those pregnant mothers. Unfortunately, for pregnant women, Qat consumption may have detrimental effects on uteri-placental blood flow and as a consequence, on fetal growth and development (Mwenda *et al.*, 2003). Lower mean birth weight have also been reported in Qat chewing mothers compared to non-chewing Qat mothers, indicating an association between Qat chewing and decreased birth weight (Abdulghani *et al.*, 1987 and Dalu, 2000). During pregnancy, Qat chewing is committing oneself to be one of the factors contributing to infant mortality. Qat is commonly chewed as well as Qat consumption affects the potency of male sexuality by affecting spermatogenesis

and plasma testosterone concentration (Abderrahman and Modallal, 2008). Qat (extract or whole) showed increased locomotors activity and reduced weight in rats (Maitai, 1977). In pregnant rats, Qat reduces food consumption and maternal weight and also it lowers the food efficiency index (Islam *et al.*, 1994).

Al-Bekairi *et al.* (1991) found that the treatment of mice with aqueous solution of cathinone at a dose of 5, 20 and 40 mg/kg over a period of six weeks produced site specific soft lesions in the axilla, chest, cervical and abdominal regions. Cathinone also produced a lopecia and inflammation around the circumference of eye leading to the formulation of abscess and closure of eye. Khat (Qat) affects pregnant women by reducing maternal daily food intake and mean birth weight of the off spring (Jansson *et al.*, 1988).

No differences in the rates of stillborns or congenital malformations were observed (Eriksson *et al.*, 1991 and Vijaibasker, 2013). Qat is also known to be excreted in breast milk, but no studies have been conducted so far on how this affects nursing babies (Al-Mugahed, 2008). In pregnant women, Qat consumption may have detrimental effects on utero-placental blood flow and as a consequence, impacts fetal growth and development (El-Shoura *et al.*, 1995). Qat affects pregnant women via reduction of their daily food intake; subsequently they give birth to malnourished infants (Al-Hegami, 2001 and Jansson *et al.*, 1988). Low birth weight is a contributing risk factor in both prenatal and infant mortality among Qat chewers during pregnancy. Qat can affect fetal development during pregnancy via placental insufficiency, which could be explained by the extremely high blood pressure observed in these women (Dhaifalah and Santavy, 2004). Lower mean birth weights have been reported in Qat-chewing mothers compared to non-using mothers indicating an association between Qat chewing and decreased birth weight (Cox and Rampes, 2003).

The mean of percentage reduction was (15.07%) for fetuses body weight. Lower mean birth weights have been reported in Qat -chewing mothers compared to non-using mothers indicating an association between Qat chewing and decreased birth weight (Cox and Rampes, 2003). Tariq *et al.* (1987) found that the methanolic Qat extract at doses of 250 and 500 mg/kg in female rats and significantly decrease the weight and length of fetuses delivered by rats treated with the extract. Savithri *et al.* (2014) observed a significant reduction in fetuses body weight and length and fetuses skeletal of pregnant mice due to sodium fluoride and Cypermethrin individual and combination treatments.

The present results may be considered as an important one to estimate gestational risk associated with insecticide exposure. In the light of the obtained results, Cypermethrin insecticides should not be used on Qat trees with caution to women who chew Qat during pregnancy. Moreover, a public awareness especially between youngsters must be announced to avoid the fatal habit and risk of Qat chewing. Therefore, this would be the responsibility of the health officers, educators, the media and growers to revise their philosophy and to implement a new policy in which Qat is no longer encouraged as an acceptable social habit in Republic of Yemen.

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## الملخص العربي

### تأثير مستخلص القات المائي مع الجرعة تحت المميّة لمبيد السيبرمثرين على أوزان وأطوال أجنة الفئران

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تم دراسة تأثير المستخلص المائي للقات والمبيد الحشري سيبرمثرين في صورة مادة فعالة وصورة مجهزة تجارياً على أوزان وأطوال أجنة الفئران من اليوم السادس إلى اليوم الثامن عشر من الحمل ، وقد وجد أن أقل تأثير علي أوزان الأجنة وأطوالها كان في المجموعات المعاملة بتركيز ٥ جم/كجم لمستخلص القات ، وبلغ متوسط النسبة المئوية للانخفاض في وزن الأجنة إلي ١٥,٠٧٪ لعينة القات المختبرة مقارنة بمجموعة الكنترول (غير المعاملة). كان هناك أيضاً انخفاض معنوي في أوزان وأطوال أجنة الفئران الحوامل سواء المعاملة بمستخلص القات منفرداً أو المبيد الحشري (سواء في صورة المادة فعالة أو الصورة التجارية) منفرداً وعُشر الجرعة تحت المميّة للمبيد الحشري السيبرمثرين مخلوطاً مع تركيز ٥ جم/كجم لمستخلص القات. وأظهر مبيد سيبرمثرين في صورته التجارية (السامبش® ١٠٪) مخلوطاً مع تركيز ٥ جم/كجم من مستخلص القات أنه أكثر تأثيراً من صورته كمادة فعالة حيث أحدث انخفاضاً معنوياً أكثر في أوزان وأطوال الأجنة مقارنةً بالكنترول حيث وصل متوسط نسبة الإنخفاض في أوزان الأجنة إلي ٤٠,٠٠٪ وبنسبة ٥٩,٣١٪ لأطوالها. وفي حالة المجموعة المعاملة بتركيز ٥ جم/كجم لمستخلص القات مخلوطاً مع عُشر الجرعة تحت المميّة للمبيد الحشري السيبرمثرين بصورته كمادة فعالة كان متوسط نسبة الإنخفاض في وزن جسم الجنين ٣٦,٢٤٪ وبنسبة ٥١,٩١٪ لأطوالها مقارنةً بمجموعة الكنترول. وعلي هذا فإن هذه الدراسة تشير إلي تجنب إستهلاك القات عن طريق الأمهات الحوامل حرصاً علي سلامة الأجنة وذلك من خلال التوعية الصحية.