

## Onion (*Allium Cepa*) and Garlic (*Allium Sativa* L.) Oil effects on Blood Glucose Levels and Body Weight of Local Quails in Erbil Province

Ahmed Ab. Abduljabbar<sup>1</sup>, Kamaran K. Abdourahman<sup>2</sup>

1- Department of Fish resources and aquatic animals, College of agriculture, Salahaddin University, Erbil, Kurdistan Region, Iraq.

٢- Department of Chemistry, College of Science, Soran University, Salahaddin University, Erbil, Kurdistan Region, Iraq.

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#### \*Corresponding Author:

Khder H. Rasul

Khder.rasul@su.edu.krd

### ABSTRACT

The current study was conducted on 38 week old of local quails. The quails were divided into four groups, randomly allocated to four dietary treatments. The diet of the first group was supplemented with 2 ml/kg of onion oils, diet of the second group supplemented with 2 ml/kg of garlic oils, the third group was supplemented with a mix of (1 ml/kg of onion oils and 1 ml/kg garlic oils), and the fourth group designed as a control with no oil supplementations. Results show that the blood glucose level, and body weight was significantly reduced by onion oil supplementation (2 ml/kg) compared to control group Whereas quails with Garlic oils (2 ml/kg) and a mixture of onion and garlic oil (1 ml/Kg of garlic and 1 ml/kg of onion oils) supplementation exhibit no significant differences in experimented parameters compared to control group. Overall, our data presented that onion can serve as good diet additive for lowering blood sugar in diabetics and decreasing body weights, It is suggested that the oils of onion protect against risks like heart failure. The varied results about hypoglycemic role of garlic oils Demanding scientists to perform further works on the garlic extract.

### 1. INTRODUCTION

Diabetes mellitus known as the highest metabolic disorder globally. Animals are varied based upon their utilization of hepatic glucose and until now, the singular animal species with largest utilization of hepatic glucose is Quail (Golden et al., 1982). The levels of blood glucose decreased by age in the birds. Researchers reported that bird ages affect biochemical parameters, while hematological profiles remained sustained (Ali & Hmar, 2012). Despite all the drug discoveries made by

scientists to manage hyperglycemia and diabetes mellitus, there are still many traditional theories are based upon by many nations to cure many health disorders using plant oils. Although, efforts has not been enough toward the efficiency improvement of the used medicinal plants (Baldé et al., 2006). Lots of Traditional therapy as a cure for diabetes mellitus has been used without knowing action onset most of these herbs (El-Soud & Khalil, 2010). Unlike previous works which they use Diabetic mellitus induction like

streptozotocin (STZ), Our study compared healthy quails feeding on different supplemented plant oils and observing the level of differences in their Blood glucose and body weight.

Allium genus chiefly garlic and onion confirmed by many studies to have a critical role in countless continuous diseases. As they are known to be full of organosulfur compounds and quercetin (Zeng et al., 2017). Onion (*Allium cepa*) belongs to Liliaceae family which is loaded in with copper magnesium and potassium, also contains small amounts of vitamins, fat, and sugar (Gabor et al., 2012). Purposes of using onions are variously known as curative plant serving as an antibacterial, antifungal agent, an antibiotic, antiseptic and anti-infectious, and also inform of vegetable and spice as a food. In addition it was proven to have an antioxidant with some anticancer properties (Ramos et al., 2006). According to (Yoshinari, Shiojima, & Igarashi, 2012) onion derivation efficacy looks to be dosage dependent. Also proven that onion derivation with its sulfur content is able to abolish lipid aggregation or differentiation in adipocyte. A study by (Goodarzi et al., 2013) showed that onion derivation can have a beneficial effect on meat-type broiler chickens by improving its growth performance. It has been reported that onion contains *S*-methyl-l-cysteine sulfoxide which showed by (Kumari & Augusti, 2002) to have hypoglycemic effect in alloxan diabetic rats.

Garlic (*Allium sativum*, Liliaceae) is a compound that loaded with bio actives, serving as a curative plant for various medical disorders. Garlic contains an amino acid loaded with sulfur called *S*-allyl cysteine (SAC) which have a critical role as an antioxidant (Saravanan & Ponmurugan, 2010). Garlic derivation showed to have a beneficial effect in conversion ratio and cumulative feed of

broilers, by rising villus height of small intestine and process activation of absorption (Fadlalla et al., 2010).

In 2016, it has been demonstrated that overweighting and obesity scales tripled dramatically since 1975, in adults overweighting reached more than 1.9 billion with more than 650 million obesity cases. The prevalence of obesity has been significantly risen due to rapid urbanization and individuals total income improvement. The obese percentages in 2016 were nearly 13% of the world's adult population (11% of men and 15% of women). In general, men are much less likely to be obese than women. The prevalence of obesity is also related to better total incomes, mainly in urban areas. Obesity is the most abundant condition that's age independent. Heading toward further complications like type 2 diabetes mellitus, heart disease, and stroke (Nasri & Shirzad, 2013). The use of synthetic drugs to control obesity are varied but the usage of these drugs regarding their safety and efficacy are not promising (Taghikhani et al., 2012).

Many medications have been used for the controlling obesity and overweight like sibutradmine and Orlistat. These drugs side effect and their efficacy limitation in the treatment of obesity become a major concern, regarding their high costs (Bahmani et al., 2016). Plant extractions, remedial sleep, acupuncture, and homeopathy become the substitutes and better options to control overweight and obesity disorders. They were already present for long times (Pittler & Ernst, 2005). The action onset of medicinal plants as anti-obesity still remained unknown. Although many theories like rising energy expenditure, lowering lipid absorption, rising differentiation of pre-adipocyte and proliferation have been suggested for those plants ( Yun, 2010). It has been indicated that onion which is known to

have *S*-methyl-l-cysteine sulfoxide is able to lower lipid levels in the serum and tissue of rats feeding on high cholesterol diet by rising lipids catabolism, subsequent excretion and decreasing endogenous lipogenesis (Kumari & Augusti, 2007).

The objective of this study was to investigate the anti-hyperglycemic and anti-obesity effect of garlic and onion oils as a supplementation additives to quails diet.

## 2. MATERIALS AND METHODS

The experimental work of this study was carried out at the GRDA RASHA field, Agriculture College, from 7<sup>th</sup> May 2017 to 7<sup>th</sup> July 2017.

### 2.1 Animal Model

60 local quail hens (40 weeks of age) of similar weight about (210g±5) were randomly assigned to four treatments. All quails were maintained under the standard laboratory condition for a temperature controlled room 35-38°C at afternoon, 28-30 C° at night and morning and were allowed free access to food and water. The quail hens were reared in special cages 65cm×60cm×50cm length, width and height respectively, designed for quails.

### 2.2 Plant Oils

Quails randomly allocated to 4 dietary treatments (Commercial plant oils purchased from markets). Each treatment comprised 3 replicates of 5 quails (at 1 male to 4 female ratios) Therefore, 4 groups containing 15 quails each were arranged. Diet is given in mash form and water supplied continuously. The diet of the first group was supplemented with 2 ml/kg of onion oil, Diet of the 2<sup>nd</sup> group supplemented with 2 ml/kg of garlic oil, the third group supplemented with a mix of (1

ml/kg of onion oils and 1 ml/kg garlic oils), and fourth group designed as a control without garlic or onion oils supplementations.

### 2.3 Diabetic Induction

All quail groups were healthy and no Diabetic mellitus inductions were injected to any of treated groups. Because the aim was to find the effect of these selected plant oils on healthy quails under normal conditions.

### 2.4 Blood glucose determination

The concentration of blood glucose was estimated by Glucometer (Viva check, Iso 15197: 2013 gm/dl, UK) at zero time (T0), fourth week (T1) and Eighth week (T2). Mortality has been recorded during last 3 weeks of the study. (Ibrahim, J. *et al.*, 2015)

### 2.5 Body weight determination

The electrical balance was used to record body weights of all quails at zero time (T0), fourth week (T1) and Eighth week (T2) of the experimental period. The Blood glucose data and body weight of the quails were subjected to statistical analysis using SPSS programs.

## 3. RESULTS AND DISCUSSION

### 3.1 Hypoglycemic Effect

The data of the current study show (table1) that the mean levels of blood glucose of control group of quails during the period of the study are T0=219.7±259, T1=236.2±45.6 and T2=227.4±17.17. They are significantly decreased during the period of the study in quails feeding with onion oil in diet (T0 217.28±8.32, T1 204.7±15.1 and T2 198.1±25.65).

**Table 1:** Shows the mean levels of blood glucose mg/dl of four treatment quail groups (Control, onion, garlic, and Mixture) at 3 different time periods (T0, T1 and T2).

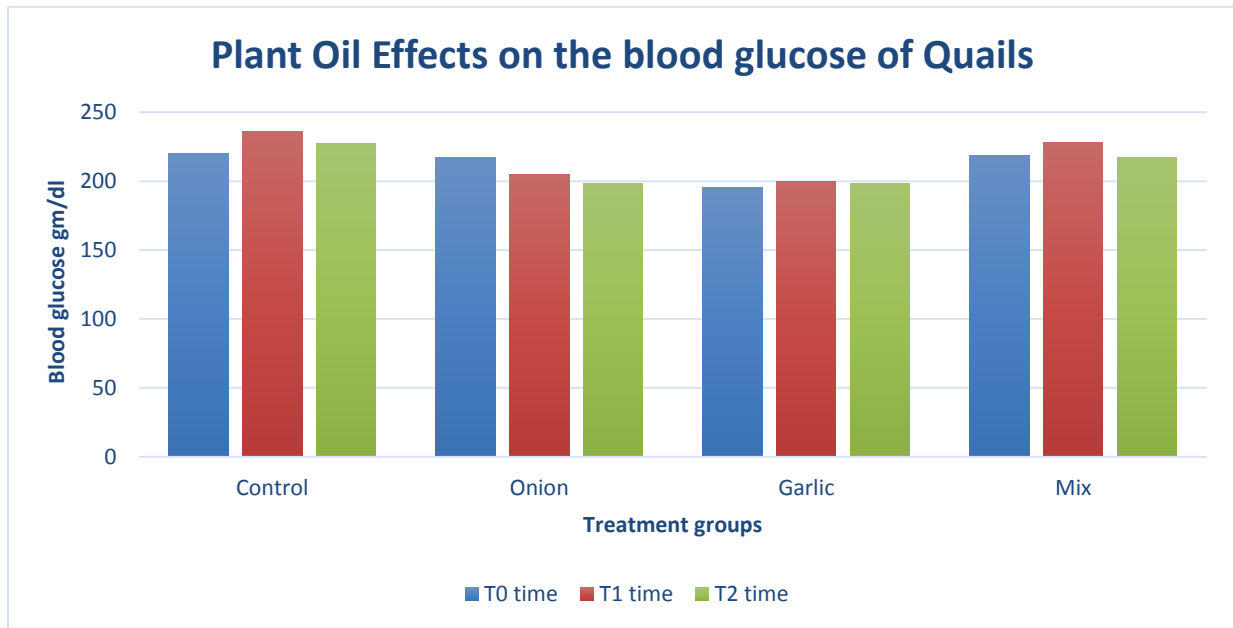
Treatments	MEAN $\pm$ ST.DEV.			
	T0 time	T1 time	T2 time	Significance
Control	219.7 $\pm$ 259	236.2 $\pm$ 45.6	227.4 $\pm$ 17.17	P > 0.05
Onion	217.28 $\pm$ 8.32	204.7 $\pm$ 15.1	198.1 $\pm$ 25.65	P < 0.05
Garlic	195.4 $\pm$ 37.83	199.83 $\pm$ 2742	198.28 $\pm$ 9.42	P > 0.05
Mix	218.8 $\pm$ 33.17	228 $\pm$ 22.78	216.85 $\pm$ 28.81	P < 0.05

Whereas there are no significant differences in the mean levels of blood glucose during the period of the study in quails feeding with garlic oil in diet (T0=195.4 $\pm$ 37.83, T1=199.83 $\pm$ 2742 and T2=198.28 $\pm$ 9.42) and mixture of garlic and onion oil (T0=218.8 $\pm$ 33.17, T1=228 $\pm$ 22.78 and T2=216.85 $\pm$ 28.81).

Our study demonstrates that Quail groups feeding on supplemented onion oil exhibit significant dropping in blood glucose levels (Table 1) which may be attributed to antioxidant properties. This is in agreement with previous studies that showed similar effects of onion oil on the level of blood glucose (Kook et al., 2009, El-Demerdash et al., 2005, Augusti & Benaim, 1975). Lee et al., 2013 reported the hypoglycemic activity of ripe onion juice at two dose levels (5 and 15 mL/kg b.w.) in the rates.

The similar data found by (Jalal et al., 2007) suggesting that the mode of action of *Allium cepa* (onion) as anti-diabetic may be caused by the antioxidant properties of its essential oil components thereby preventing hyperglycemia. In addition it has been reported that the ingestion onion (*Allium cepa*) (100 g) caused a

considerable reduction in fasting blood glucose levels which could be used as a dietary supplement in management of type 1 and/or type 2 diabetes mellitus (Taj Eldin et al., 2010).



**Figure 1:** Shows the mean levels of blood glucose pooled (males and females) quails feeding on different supplemented oils (Garlic, Onion, and Mixture of both oils). T0: Time zero, T1: After four weeks, T2: After eight weeks.

This study shows that there is no effect of Garlic oil on the mean levels of blood glucose of quails (figure 1). This finding can be supported by (Kook et al., 2009). In accordance with our study, another work done by (Ashraf et al., 2011) concluded that garlic only not enough but a Combination of garlic with typical anti-diabetic remedy has shown to improve glycemc control. Also (Baluchnejadmojarad & Roghani, 2003) found no hypoglycemic effect of an aqueous extract of garlic in streptozotocin-induced diabetic rats. Treatment of fructose-induced insulin resistance rats with aqueous garlic extract (500 mg/kg BW/day, i.p.) for a period of four weeks did not have any effect on the intraperitoneal glucose tolerance (Jalal et al., 2007). The garlic

powder did not show significant effect on body weight of quails. (Yalçın et al., 2007). It has been reported that diet supplemented with garlic oils (1ml/100 g) didn't significantly change the rat body weight (Masjediet al., 2013b).

While the salutary role of garlic in type 1 diabetes are established by Several studies documenting the efficacy of garlic in reducing blood glucose in various animal models of type 1 diabetes mellitus (Banerjee et al., 2002, Ohaeri, 2001, Kumar & Reddy, 1999, Padiya et al., 2011).

Sustained blood glucose of quails supplemented on mixture (1% garlic and 1% onion) oils presented by us, may be due to its low percentage of plant oil

supplementations presented in the quail's diet. Until now there is no study showing that mixture oils of *Sativium* sp. could have hypoglycemic activities.

### 3.2 Body weight Effect

Our results show that at zero time the body weight of all three experimental groups were not significantly different and they were staid under 270 g (table 2). The

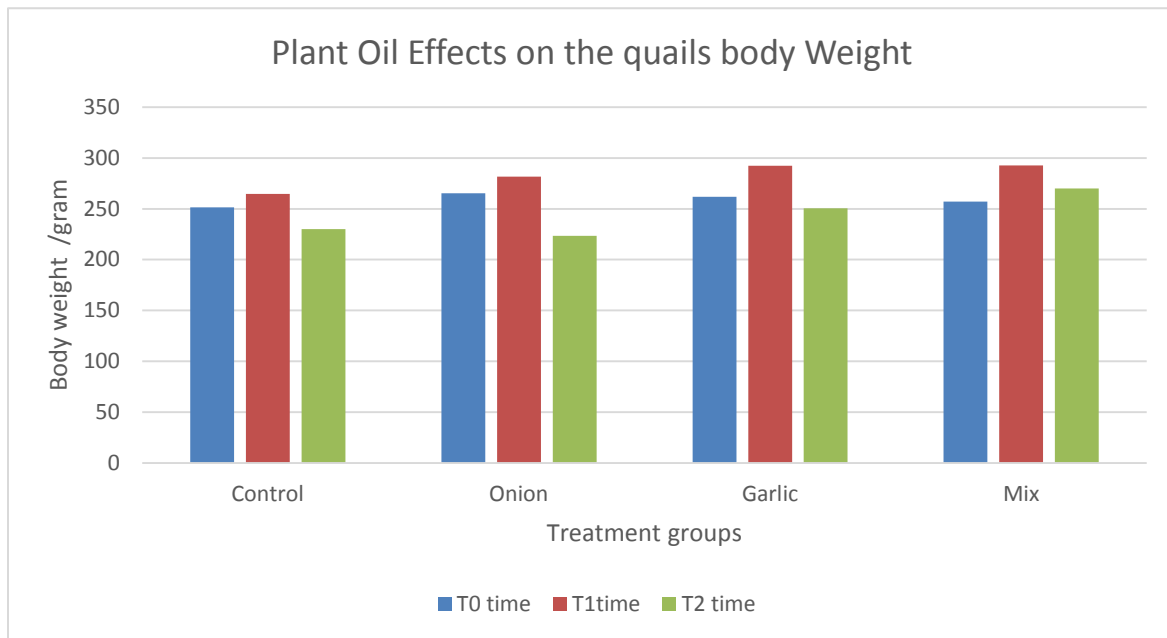
body weight of quails at T1 (at 4 weeks) were slightly raised in all the studied groups but not significantly different. There was a significant decrease in the body weight of quails under supplemental onion oil diet, from 281.66±42.93 g at fourth week to 223.33±32.65 g at the Eighth week of the study. The body weight of quails feeding on diets with garlic and mixture oils showed no significant differences between T1 and T2 periods of the study.

**Table 2:** Shows body weights in g for four treatment quail groups (Control, onion, garlic, and Mixture) at 3 different time periods (T0, T1 and T2).

	MEAN ±ST.DEV.			
Treatments	T0 time	T1time	T2 time	Significance
Control	251.5±34.46	264.54±21.04	230±15.63	P > 0.05
Onion	265.35±44.18	281.66±42.93	223.33±32.65	P < 0.05
Garlic	261.78±48.82	292.5±40.15	250.55±27.73	P > 0.05
Mix	257.08±31.14	292.72±40.86	270±35.74	P > 0.05

These data show that onion oils reduced significantly body weight of quails ( $P < 0.05$ ), this is in agreement with Kook et al., 2009. Body and adipose tissue weights, fasting blood glucose level were also improved in 5% of onion extract-fed group. Onion extract and its sulfur-containing compounds, suggesting that these compounds may play a vital role in suppressing obesity. The present study showed that the anti-obesity effect of onion

in the rodent that may be beneficial for human health (Yoshinari et al., 2012). Goodarzi & Nanekarani, 2014 demonstrated that possibly onion could improve growth performance of chicks due to the content of organosulfur compounds. Similar results of Aji et al., 2011 and Goodarzi et al., 2013 reported the positive influence of broilers fed diets containing fresh onion on body weight.



**Figure 2:** Shows that the body weight not effected when quails feed on supplemented plant oils (2 % onion oils, 2% garlic oils and 2% mixture of both oils ) during two-month study project.

The present study shows that garlic oil does not influence the body weight of quails throughout the studied period (figure 2). This is in agreement with Kook et al., 2009. Whereas it is in disagreement with Karangiya et al., 2016, who Showed that diet containing 1% garlic significantly increased body weight of broiler chicks. Our finding present that mixture oils of garlic and onion have no significant influences on the body weights. Similar result has been found by Karangiya et al., 2016, concluded that the body weight gain (g/bird) was not significantly ( $p < 0.05$ ) changed by diet treated with garlic and ginger mixture supplements.

#### 4- CONCLUSION

The onion extract could have beneficial effects in reducing the levels of blood sugar suggesting that dietary onion supplementation may help diabetics to reduce over Dependence on drugs. our data presented that onion can serve as a good diet additive for body weight loss, which can be used by the physicians to help overweight individuals before facing series disorders like hypertension and cardiovascular diseases. Further studies must be done to analysis onion oils contents responsible for these beneficial effects. There are some contradictory results about the hypoglycemic role of garlic oils, therefore scientists need to perform more investigations in order to determine the exact dosage of garlic oils additives to the

diets to be effective in reducing blood sugar levels.

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