

## The Effect of Basil and Cloves in Lowering Blood Pressure in Rats Suffering from High Blood Pressure

Mahmoud, M. Y. and Omyma M. EL Darder

Department of Home Economics, Faculty of Education, Suez Canal University, Egypt



### ABSTRACT

The aim of this study was to conduct the possible antihypertensive effects of basil (*Ocimum basilicum*) and cloves (*Syzygium aromaticum*) in high blood pressure rats. The rats (n=30) were divided into two main groups, the first main group (n=6 rats) fed on basal diet as a control negative group. The second main group (n=24 rats) received high sodium diet for 8 weeks to induce hypertensive in rats. After these periods, the high sodium diet group was divided into (4) subgroups (n=6 rats for each), the first subgroup fed on high sodium diet as a control positive group. Subgroups (2, 3 and 4) were fed on high sodium diet supplemented with basil (200mg/kg1 per day), cloves (200mg/kg1 per day) and (basil 100gm/kg + cloves 100gm/kg per day) respectively. Results: the results cleared that, basil, cloves and mixture of them reduced systolic and diastolic blood pressure. In addition to significant decrease in the mean values of total lipid profile, glucose, Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) in all treated groups, compared to positive control groups, while high-density lipoprotein (HDLc) increased.

**Keywords:** basil; cloves; high sodium diet; hypertensive rats; experimental hypertension

### INTRODUCTION

Heart disease, stroke, and renal failure are leading causes of death with hypertension being the predominant risk factor (Mozaffarian and Benjamin, 2016). High blood pressure is one of the most important risk factors for cardiovascular disease, myocardial infarction, stroke, congestive heart failure, end-stage renal disease, and peripheral vascular disease (Whelton., 1994). Basil is a delicious herb that goes well in a variety of foods. It is widely available throughout the world. Basil has antioxidant, antimutagenic, antitumorogenic, antiviral, and antibacterial properties. Extract of basil has been shown to lower blood pressure (John, 2016). Basil is a versatile herb. It is rich of nutrients, from large amounts of vitamin K and calcium, to its high antioxidant oils, basil offers a collection of health-enhancing avails ranging from protection against DNA damage to fight against stress (Anwar *et al.*, 2010). A diversity of pharmacological effects has been attributed to clove oil. Among these effects are antibacterial, antifungal antispasmodic flavoring agent in foods, pharmaceuticals, and herbal medicine and clove cigarettes. Recently we have reported that the clove oil (eugenol) exhibits antihypertensive and spasmolytic activities in anaesthetized rats (Gertsch *et al.*, 2008).

### MATERIALS AND METHODS

#### Materials:

- Casein, vitamins, minerals, cellulose and choline chloride were purchased from El-Gomhoreya Company, Cairo, Egypt.
- Thirty female albino rats (Sprague Dawley Strain) were obtained from Helwan farm.
- Cloves and basil were purchased from local market, Cairo, Egypt.

#### Methods.

##### The Biological Assay.

Thirty male Swiss albino mice (200-210 g), obtained from Small Animal House were maintained individually in polypropylene cages on basal diet (Laekeman *et al.*, 1990) for 1 wk, for adaptation, the

vitamin mixture was prepared according to (Reeves *et al.*, 1993) and the salt mixture was prepared according to (A. O. A. C., 1975). After this period, the thirty male albino rats were divided into two main sections, the first section (n=6 rats) fed on basal diet and kept as a negative group. The second section (n=24 rats) received a high-salt (8%) diet for 8 weeks to induce hypertension in rats (Jian-Wei *et al.*, 2008). Systolic and diastolic blood pressure was measured weekly by a tail cuff method, after 8 weeks, when hypertension was established. The second group (n=24 rats) divided into four groups of 6 rats: (1) negative control group, (2) a group treated with basil (200mg/kg1 per day), Doses of basil were selected in reference to doses normally used in man, and doses used in previous experiments (Inoko *et al.*, 1994). (3) A group treated with clove (200mg/kg1 per day), (Tohti *et al.*, 2006) and (4) a group treated with (100 gm basil + 100 gm cloves /kg1 per day). At the end of the experiment, the blood samples were collected for centrifuged and serum was separated to estimate some biochemical parameters, i.e. serum cholesterol (Allain *et al.*, 1974), triglycerides (Foster and Dumns., 1973), HDL-c (Lopes - Virella *et al.*, 1977), LDL-c and VLDL-c (Friedwald *et al.*, 1972). Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) (Reitman and Frankel., 1957). Data was presented as means  $\pm$  SD statistically analyzed using one way ANOVA test,  $p < 0.05$  was used to indicate significance (Steel and Torri., 1980).

#### Blood pressure measurement.

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured by the tail-cuff method (NIBP200A Small Animal Tail Blood Pressure System) in a wake rats. Each value was the average of three consecutive readings.

### RESULTS

#### 1-Blood pressure systolic blood pressure (SBP) and diastolic blood pressure (DBP).

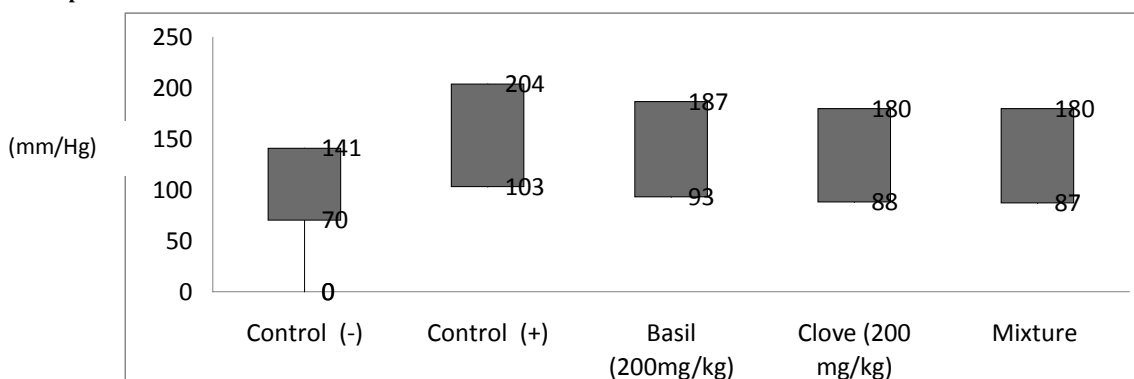
Data in table (1) showed that, untreated hypertensive rats had markedly higher SBP and DBP than the negative control group (Table 1). In the

treatment groups, the blood pressure, which was initially the same as that of the hypertensive controls, decreased progressively over the cycle of the treatment ( $P < 0.05$ ), sans obvious difference between treatment groups, and it was still significantly greater than in negative control group (Figure 1).

**Table 1. Effect of basil and clove on blood pressure (SBP) and diastolic blood pressure (DBP).**

Parameters Groups	SBP	DBP
	(mm/Hg)	
Control (-)	141±2	70±3
Control (+)	204±4 <sup>a</sup>	103±3 <sup>a</sup>
Basil (200mg/kg)	187±4 <sup>abc</sup>	93±4 <sup>ac</sup>
Clove (200 mg/kg)	180±8 <sup>abc</sup>	88±6 <sup>abc</sup>
(Basil 100mg+Clove 100mg)	183±3 <sup>abc</sup>	87±4 <sup>abc</sup>

Abbreviations: (DBP), diastolic blood pressure; (SBP), systolic blood pressure. –



**Figure 1. Effect of basil, clove and mixture of them on (SBP) and (DBP) blood pressure in hypertensive rats, compared with positive control rats and negative control rats.  $P < 0.05$ , all treated groups vs. positive control rats**

**2- Effect of basil and clove on lipids fractions of hypertensive Rats.**

Data in table (2) showed that. The mean values of serum cholesterol, triglycerides, LDL-c and VLDL-c (mg/dl) significantly increased  $P < 0.05$  for control positive group, in comparison with control negative group, while HDL-c value (mg/dl) for control positive group decreased than that of the control negative group. Addition of basil or clove or mixture of both resulted in a significant reduction in cholesterol values. Rats which received high salt diets and treated with basil or clove or mixture of both had lower mean values of triglycerides, LDL-c and VLDL-c compared with control positive group.

On the other hand, the same treated groups of rats had higher mean values of HDL-c than that of the control positive group. The best result for lipid fractions

Eugenol (Eug), a major constituent of oil of clove (Leal- Cardoso *et al.*, 1994). Treatment with Eugenol induced changes in mean aortic pressure (MAP) and heart rate (HR) (Lahlou *et al.*, 1999). Both in vivo and in vitro studies Proposed that the hypotensive response to EOCN (Lahlou *et al.*, 1999).

Basil reduced systolic and diastolic blood pressure by about 20 and 15mmHg, respectively, compared with 35 and 22mmHg for captopril, and from the lowest dose tested with no dose dependency. A crude extract of *O. basilicum* causes a fall in systolic, diastolic, and mean BP in a dose-dependent manner with median effective dose of 30 mg/kg (Anwar *et al.*, 2010)..

was noticed in the group of rats treated with clove, followed by group that treated with mixture of (basil +clove) and finally group of rats treated with basil (Table 2). Our results are in agreement with many studies which showed that basil leaf extract prevented the development of high total cholesterol and LDL cholesterol in rats fed a high cholesterol diet (Suanarunsawat *et al.*, 2011).

**3- Effect of basil and clove on liver function.**

Data in table (3) showed that, the rats in control negative group had a significant lower mean values than that of control positive group (hypertensive rats) as the following ( $46.047 \pm 4.035$  and  $21.440 \pm 2.677$  u/l vs.  $76.810 \pm 4.833$  and  $43.648 \pm 3.460$  u/l, respectively). In a rat study, clove reduced levels of cytochrome P450 enzymes (Kumari ., 1991).

**Table 2. Effect of basil and clove lipids fractions of hypertensive rats.**

Parameters Groups	Cholesterol	Triglycerides	HDL-c	LDL-c	VLDL-c
	mg/dl				
Control (-)	84.682 <sup>e</sup> ± 5.377	41.250 <sup>f</sup> ± 2.179	44.488 <sup>a</sup> ± 4.228	31.944 <sup>b</sup> ± 0.815	8.250 <sup>f</sup> ± 0.435
Control (+)	148.013 <sup>a</sup> ± 5.502	79.665 <sup>a</sup> ± 6.008	23.020 <sup>d</sup> ± 2.264	109.059 <sup>a</sup> ± 2.420	15.932 <sup>a</sup> ± 1.201
Basil (200 mg/kg)	125.839 <sup>b</sup> ± 5.188	68.638 <sup>b</sup> ± 4.071	31.877 <sup>c</sup> ± 3.164	80.234 <sup>b</sup> ± 1.957	13.727 <sup>b</sup> ± 0.814
Clove (200 mg/kg)	113.615 <sup>c</sup> ± 4.834	59.927 <sup>cd</sup> ± 4.246	37.132 <sup>b</sup> ± 3.491	64.498 <sup>d</sup> ± 0.980	11.985 <sup>cd</sup> ± 0.849
Mixture (basil 100mg+clove 100mg)	115.292 <sup>c</sup> ± 1.620	64.150 <sup>bc</sup> ± 0.963	31.853 <sup>c</sup> ± 1.002	70.608 <sup>c</sup> ± 1.736	12.829 <sup>bc</sup> ± 0.192

-Values are expressed as mean ± SD.

- Significant at  $p < 0.05$  using one way ANOVA test.

- Values which have different letters in each column differ significantly, while those with have similar or partially are not significant

Treatment with CCl4 significantly increased the activities of transaminases Serum Glutamic Oxalocetic Transaminase(SGOT)and Serum Glutamic Pyruvic Transaminase (SGPT), and alkaline phosphatase (ALP). These activities were significantly decreased by basil extract. Clove administration has tendency to retrieve levels of AST, ALT(Galila *et al.* , 2012) ,When basil or clove was added to the high sodium diet of hypertensive rats a significant decrease of AST and ALT values were noticed in comparison to control positive group. The best results were for group of rats fed on clove (200mg/kg). (Lahon and Das. 2011)reported that the basil (*Ocimum sanctum*) alcoholic leaf extract shows significant hepatoprotective activity and synergism with silymarin. A study published in the Journal of Medicinal Food found that when sickly rats were given basil extract over a period of five days, they experienced significant improvements in producing detoxifying enzymes, higher antioxidant defenses and a reduction of fat buildup in the liver that can cause liver disease (Manikandan *et al.* , 2007) . Holy Basil seems to be effective in preventing toxin-induced damage to the liver in doses of 100-200mg/kg bodyweight (Ubaid. 2001). These protective effects are due to a supposed membrane stabilizing effect of Holy Basil constituents (Lahon and Das. 2011)

**Table 3. Effect of basil and cloves on liver function.**

Parameters Groups	SGOT	SGPT
	u/l	
Control (-)	46.047 <sup>d</sup> ± 4.035	21.440 <sup>f</sup> ± 2.677
Control (+)	76.810 <sup>a</sup> ± 4.833	43.648 <sup>a</sup> ± 3.460
Basil (200mg/kg)	67.395 <sup>b</sup> ± 2.820	34.627 <sup>b</sup> ± 2.964
Clove (200 mg/kg)	57.051 <sup>c</sup> ± 4.238	31.413 <sup>b</sup> ± 2.601
(basil 100mg+clove 100mg)	64.991 <sup>b</sup> ± 4.038	31.850 <sup>b</sup> ± 2.185

Values are expressed as mean ± SD. Significant at p<0.05 using one way ANOVA test. Values which have different letters in each column Differ significantly, while those with have similar or partially are not significant.

### CONCLUSION

In conclusion, consumption of dried basil and cloves at certain levels 200mg/kg in this study may be useful for treatment of hypertensive because their lowers lipid profile and liver functions. Further studies are recommended to determine the medicinal effect of other different fractions of dried basil and cloves. Also should be noted to the importance of antioxidants in of these herbs and their relation to the treatment of hypertensive and improving the lipids and liver enzymes

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### تأثير الريحان والقرنفل في خفض مستوى ضغط الدم لدى الفئران التي تعاني من ارتفاع ضغط الدم محمد يوسف عبد الحميد محمود و اميمة محمد الدردير قسم الاقتصاد المنزلي – كلية التربية – جامعة قناة السويس

اجريت هذه الدراسة لمعرفة تأثير كلا من الريحان والقرنفل في خفض مستوى ضغط الدم لدى الفئران المصابة بارتفاع ضغط الدم. وقد استخدم في هذه التجربة عدد (30) فار تم تقسيمهم الى مجموعتين رئيسيتين ، المجموعة الرئيسية الأولى وعددها ( 6) فئران تغذت على الغذاء الأساسي كمجموعة سالبة ، و المجموعة الرئيسية الثانية عددها (24) فار تناولت الغذاء المعد للتجربة العالي في محتواه من الصوديوم لمدة 8 أسابيع وذلك لرفع مستوى ضغط الدم في الفئران بعد هذه الفترة تم تقسيم المجموعة الرئيسية الثانية الى 4 مجموعات فرعية عدد الفئران في كل مجموعة (6) فئران كالاتى المجموعة (1) استمرت على الغذاء العالي في محتواه من الصوديوم كمجموعة موجبة بينما تغذت المجموعات الفرعية (3و4و5) على الغذاء العالي في الصوديوم والمدعم بالريحان والقرنفل المجفف وخليط منهما بجرعة (200 ملجم / كجميوميا ) عل التوالى . وقد اشارت النتائج الى ان المجموعات التي تلقت الريحان والقرنفل والخليط منها الى حدوث انخفاض في مستوى ضغط الدم الانقباضي والانبساطي لدى الفئران . بالإضافة إلى انخفاض ملحوظ في متوسط القيم من إجمالي الدهون والجلوكوز ، اسبارتاتي ترانسفيراز الأمينية (AST) وترانسفيراز الأمينية ألانين (ALT) في جميع المجموعات المعالجة، مقارنة مع المجموعة الموجبة، في حين أن البروتين الدهني عالي الكثافة (HDL) قد ازداد .