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EVALUATION OF ANTIHYPERTENSIVE POTENTIAL OF AERIAL PARTS OF *BETA VULGARIS*

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ABSTRACT

Beta vulgaris, are herbacious biennial root vegetables belonging to the family Chenopodiaceae grown for their edible root. Beetroot juices are beneficial in reducing blood pressure. A commonly known plant among practitioners of used by folklore peoples. The aerial parts were screened for its antihypertensive activity on animal models. It was found that effect of *beta vulagris* showed significant antihypertensive activity just like reference drug by significantly reducing the salt induced hypertension in rats. In conclusion, with sodium intake groups to check the cardiovascular properties they should be avoiding sodium intake and high fatty diet. Patients with the risk of hypertension and obesity have proper abrasions towards the regulation sodium intake, which can decrease the risk of cardiac or renal diseases. Thus it can be concluded that *beta vulgaris* proves its activity scientifically as because it is well correlated with the presence of phytoconstituent (flavonoids). The flavonoid moiety helps in breaking down the excess of fat deposition, acts by the mechanism of liposuction within the cells, and prevents CVS disorders. Thus, the results suggested that more amount of sodium in diet could be dangerous with the patients suffering from obese nature or hypertension. Increased amount of salt holds stress on overworked cardiovascular system. Thus, a reduction in the intake of sodium serves as a intake which could be very beneficial to human race.

Keywords: *Beta vulgaris*, Antihypertensive, Biennial, flavonoids

Abbreviations- BV- Beta Vulgaris; SBP-Systolic Blood Pressure; DBP-Diastolic Blood Pressure

1. INTRODUCTION:

The phrase herbalism applies to the area where the usage of medicinal plants are seen to its maximum for the exploration. This field of herbals, which is long, are often from the ancient age extends to other sources which are seen in nature or in various microorganism from which the active constituents are achieved. Usage of plant and their products are from the prehistoric age to scientific age. There are nearly more than 7500 plant and their species, which are un identical, and most of them are unexplored due to various geographical and physical conditions laid down. Some are due to the over exploitation of the resources which are widely done and used in day-to-day life **[1]**. Various organizations those who are involved in the conservation of Medicinal and herbal drugs have issued various guidelines and facts about their usage and their mode of action but still it's under consideration ad plants possess various constituents which are responsible for healing the aliments. The herbs and herbal products, which are obtained, act as dietary supplements in most of the countries due to its nutritional values and GMP (Good Manufacturing Practices) seal of approval on their products **[2]**. It is observed that many plant based products or active constituents obtained from sources of tissue culture or conservation do not undergo the process of preclinical study pattern which thereby leads to an arbitrary result for the clinical studies due to lesser toxicity. Due to which some toxic or allergenic contain products are obsolete and forbidden as the therapeutic activity is not seen **[3]**. Products which are reliable and safe can be used in patients suffering from carcinoma (12%), hepatic disorders (21%), autoimmune deficiencies and its virus (22%), breathing issues (24%) and rheumatologically disorders (26%) **[4]**. The plant taken up for the study *Beta vulgaris* belonging to Chenopodiaceae is a herbaceous vegetable. It is an erect plant with rosette leaves and possess red color roots. The plant accounts to betacyanins 75-95%) along with betaxanthine and betalaines. The plant is effective against many pharmacologically aliments like antioxidant, Anti-inflammatory, Cancer, Antihypertensive, Urinary defects, skin disorders, in hepatic failure etc. Thus, to claim and understand the traditional usage the plant was studied for its antihypertensive activity.

2. MATERIALS & METHODS

2.1. Collection and identification of plant material

The specimen for the proposed study was collected from district of Gautam Budh Nagar (U.P) and dried properly. A

herbarium file was prepared and the plant specimen was named as SAMPLE- A. The herbarium file was submitted to Taxonomical Department of National Bureau of Plant Genetic Resources (NBPGR), PUSA for Authentication. Anjula Panday (Principal scientist) authenticated the specimen as Beta vulgaris. A voucher specimen is preserved in the herbarium section of taxonomic department of NBPGR, New Delhi.

2.2. Experimental animals:

Albino wistar rats weighing between 150-250 gms of either sex was used for antihypertensive activity. The animals suggested for the experimental study were kept in cages made up of standard polypropylene and were provided with standard food pellet and water *ad libitum.* Institutional Animals Ethics Committee (Regn No: 1845/PO/Re/S/16/CPCSEA, 12/1/16) approved the experimental protocols.

2.3. PRELIMINARY PHYTOCHEMICAL SCREENING

The coarsely powdered leaf material was extracted with various solvent (petroleum ether, ethyl acetate, chloroform, methanol, dist. Water) as per their polarity range for the investigation of primary and secondary metabolites present in it. The preliminary phytochemical screening was carried out to obtain the best solvent to be used for further extraction procedure, which carries maximum active constituent in it. The extraction process was carried out by hot continuous method by using hydroalcoholic extract in the ratio of 50:50. The extraction process was carried out to find out the chemical constituents such as alkaloids **[6]**, flavonoids **[7]**, Glycosides **[8, 9]**, Mucilage **[10]**, proteins **[11]**, Reducing-agent **[12]**, Saponins **[13]**, Steroids **[14-16]**, Sterols, Triterpenes **[17]**, Tannins **[18]**, Flavonoids **[19]** glycosides, proteins, amino acids, saponins, steroids and fixed oils **[5]**. Using reported methods & are reported in **Table 2**.

2.4. EXTRACTION PROCEDURE

The leaves along with aerial parts were cleaned under running tap water to remove the debris present on the surface of the sample. The washed cleaned samples were dried under shade for a day and further dried in oven at a temperature 40ºC and were checked for any contamination or microbial attack. The dried samples were grinded mechanically and were passed through sieve no-40. Further, the powdered material was defatted with petroleum ether to remove the fatty or oily suband then hydro alcoholic extraction was carried out in 1:1 ratio of alcohol and water for 72hrs. After 72hrs of extraction the material was cooled and filtered. The filtrate was subjected to distillation process for the removal of solvent. Further, when

the distillation was towards 1/3 volume, it was removed and placed over water bath on a previously tarred container and it was evaporated. Finally, it was cooled and kept overnight. The extract yield was found to be 10.0%w/v. on the basis of the formula given below **[20-22]**.

$$\text{Percentage yield} = \frac{\text{wt. of extract – wt. of empty china dish}}{\text{Wt. of powdered drug}} \times 100$$

2.5 ANTIHYPERTENSIVE ACTIVITY

2.5.1 Experimental Animal

Wistar albino rats of either sex weighing between 150–180 gm were used for the study. Six rats were taken for each group. They were procured from central animal house of NIET, Greater Nodia. The rats were acclimatized prior to the experiment and after seven days, they were taken up for the experiment. All the animals were fed with rodent diet and water *ad libitum*. Protocol was approved from the Institutional Animal Ethics Committee (IAEC) and Reg. No: 1845/PO/Re/S/16/CPCSEA, 12/1/16.

2.5.2 Animal Model of hypertension

Anti hypertension activity was analyzed by two models, Salt induced hypertensive activity and Obesity induced hypertension. In Salt induced hypertensive activity, all rats except normotensive control were on kept on a diet with 8% NaCl solution to their feed to accelerate the progression and severity of hypertension for 6 weeks. In Obesity induced hypertension, Marketed protein supplement (200 mg/kg) was given to rats. Obese rats show persistent hypertension after 8 weeks of age. Weekly body weight, Blood glucose level and Blood pressure changes are recorded in the different experimental groups by using glucometre and biopac.

Table 1: Composition of high fatty diet (HFD)

S. No.	Composition of high fat diet (HFD)	g/kg
1	Fat	50
2	Vegetable oil	207.3
3	Carbohydrates	90.5
	Sucrose (Wheat middling's)	325
	Proteins	20
	Casein (paneer)	30
	soya chunks	40
	Vitamin Mix	
	Mineral mix	

3. RESULT & DISCUSSION

3.1 PHYTOCHEMICAL Investigation

The results of phytochemical investigation are as follows which is shown in **Table 2**.

Thus, it is clear from the observations of the screening that the solvent methanol exhibits the presence of maximum number of phytoconstituents, water comes next depicting presence of same constituents of the methanol except. From the above analysis it was concluded that the methanol is the ideal solvent which can be used for extraction as it contains maximum number of phytoconstituents.

3.2 ANTIHYPERTENSIVE ACTIVITY

3.2.1 Salt induced hypertensive activity (Table 3)

In **Table 3 and 4** the effect of *Beta vulgaris* on salt induce hypertension was studied. It was observed that in first six weeks of salt intake a progressive increase was seen in the mean systolic blood pressure and diastolic blood pressure when compared with the normotensive group. It was observed after 7th week a reduction in systolic and diastolic blood pressure. So, results show that the hydro alcoholic extract is efficient as antihypertensive agent. The previous interventions regarding hypertension triads revealed the risk treatment and could reduce the strokes and coronary heart disease.

3.2.2 Obesity induced hypertensive activity (Table 7).

Table 2: Preliminary phytochemical investigation of aerial parts of *Beta vulagris*

Phytoconstituents	Solvent				
	Petroleum ether	Chloroform	Ethyl acetate	Methanol	Distilled water
Protein and amino acids	-	-	-	+	+
Saponin	-	-	-	+	+
Phytosterols	+	-	-	+	-
Tanins	-	-	-	+	+
Fixed oil & fat	+	-	-	-	_
Gum & mucilages	-	-	-	+	+
Flavonoids	_	+	-	+	-
Glycosides	+	-	-	+	+
Alkaloids	-	+	-	+	+
Carbohydrates	-	-	-	+	+

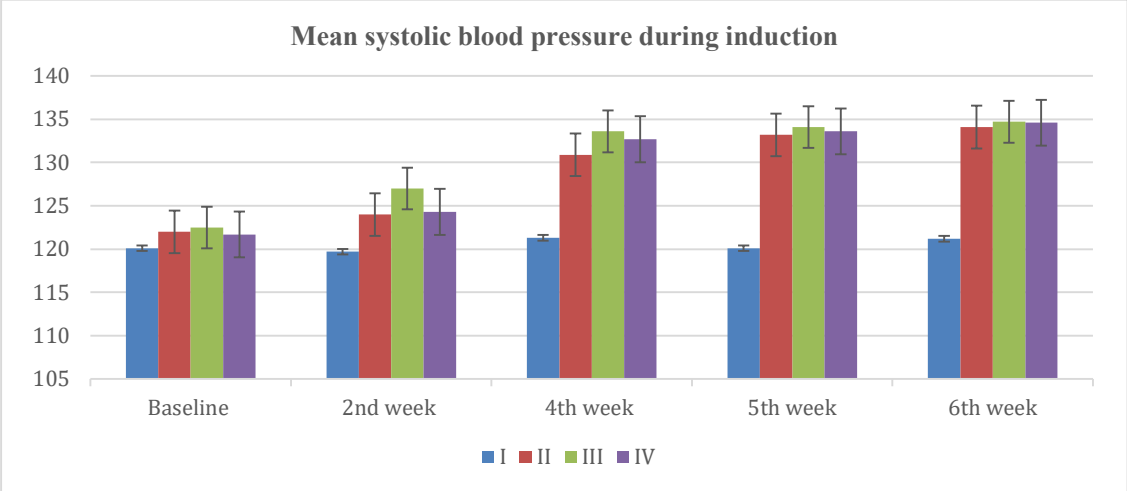
Key words: (+) Indicate presence, (-) Indicate absence

Table 3: List of groups

Group	Description	Dosage
I	Normal untreated	--
II	Hypertensive treated (Amaday)	5mg/kg
III	Hypertensive untreated	--
IV	Hypertensive treated (*Beta vulgaris*)	300mg/kg

Tables 4: Effect of *Beta vulgaris* on salt induce hypertension in experimental rats. Mean systolic blood pressure during induction

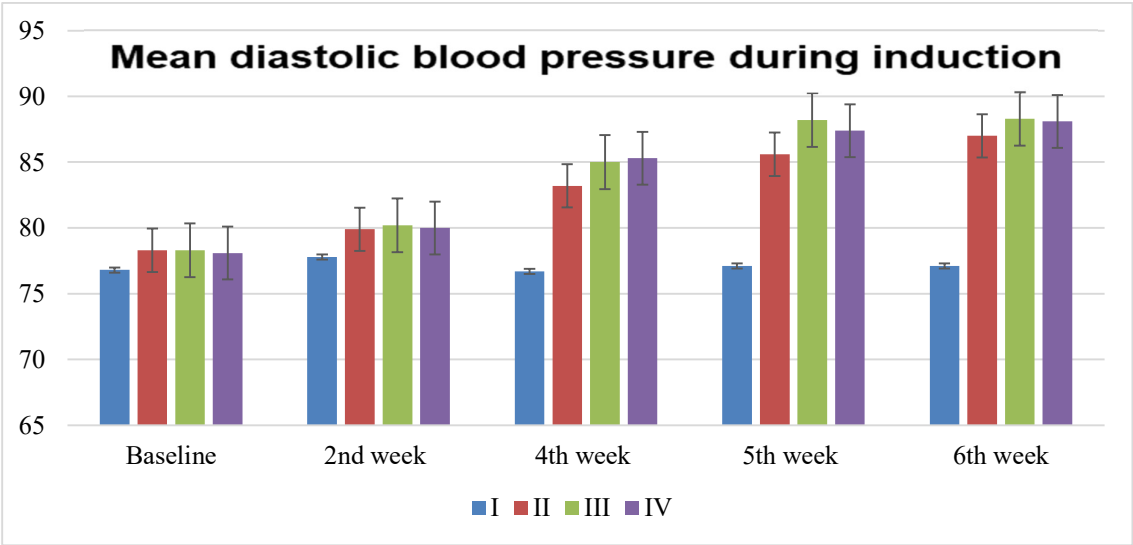
Groups	Baseline	2nd weak	4th weak	5th weak	6th weak
I	120.1± 0.52	119.7± 0.54	121.3± 0.65	120.1± 0.68	121.2± 0.68
II	122.0± 0.88	124.0± 0.72*	130.9± 0.72**	133.2± 0.26**	134.1± 0.29**
III	122.5± 0.99	127.0± 1.08**	133.6± 0.18**	134.1± 0.19**	134.7± 0.13**
IV	121.7± 0.12	124.3± 1.61**	132.7± 0.46**	133.6± 0.23**	134.6± 0.17**



Values are in mean+ SEM. **significantly different (p<0.01) from group I (nonmotensive), * significantly different (p<0.05) from group

Table 5. Effect of *Beta Vulgaris* on salts induce hypertension in experimental rats. Mean diastolic blood pressure during induction

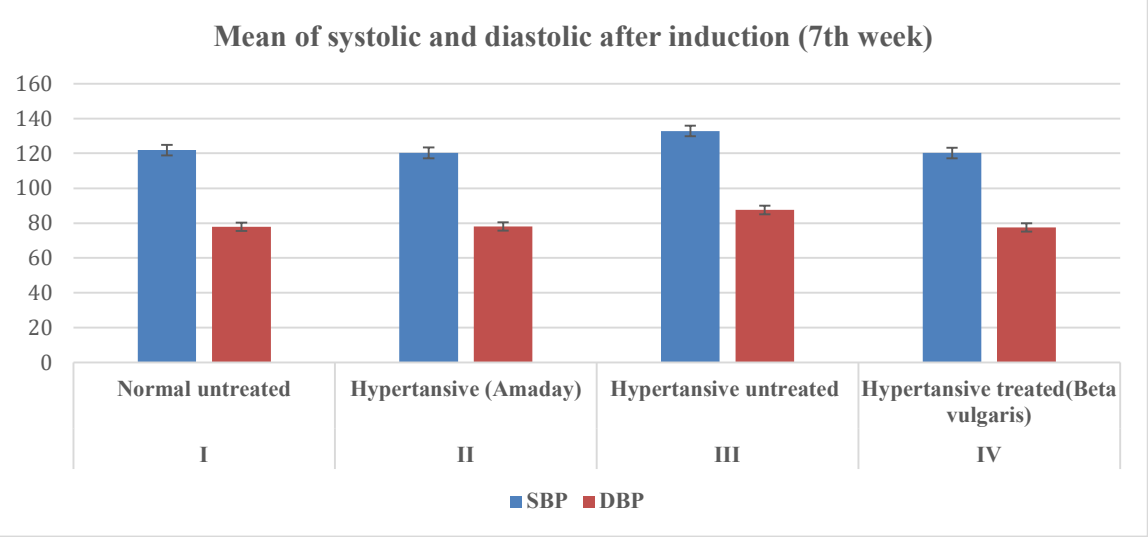
Groups	Baseline	2nd weak	4th weak	5th weak	6th weak
I	76.8± 0.40	77.8± 0.25	76.7± 0.49	77.1± 0.23	77.1± 0.62
II	78.3± 0.33*	79.9± 0.47**	83.2± 0.66**	85.6± 0.58**	87.0± 0.81**
III	78.3± 0.32*	80.2± 0.37**	85.0± 0.74**	88.2± 0.52**	88.3± 0.60**
IV	78.1± 0.44*	80.0± 0.53**	85.3± 0.61**	87.4± 0.60**	88.1± 0.68**



Values are in mean+ SEM. **significantly different (p<0.01) from group I (nonmotensive), * significantly different (p<0.05) from group I

Table 6: Mean of systolic and diastolic after induction (7th week)

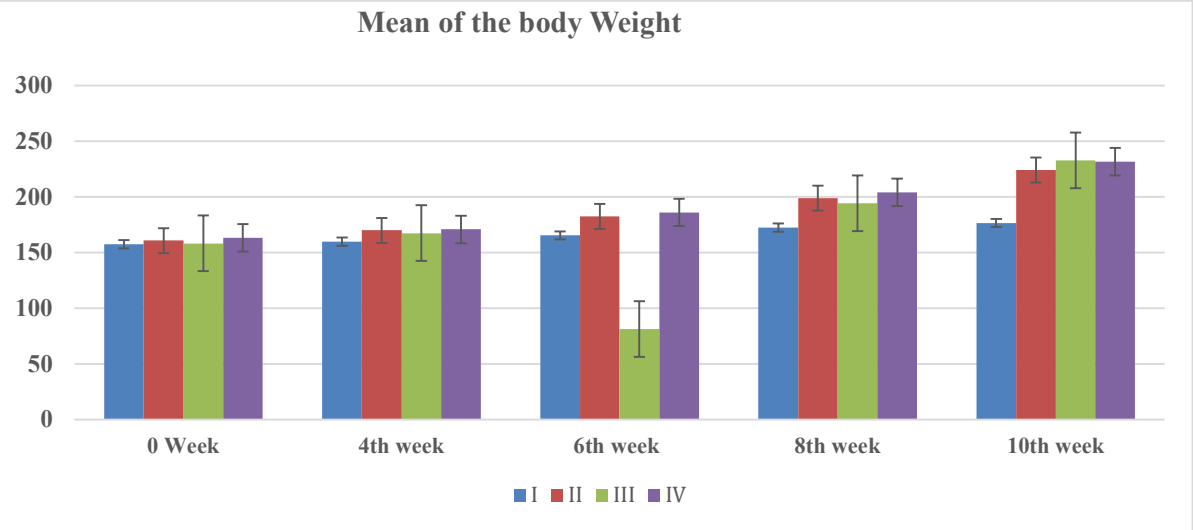
Group	Description	SBP	DBP
I	Normal untreated	121.9± 1.17	77.9 ± 0.72
II	Hypertensive treated (Amaday) Hypertensive	120.3± 0.98	78.1 ± 0.47
III	untreated	132.9± 0.92**	87.5 ± 0.55**
IV	Hypertensive treated (*Beta vulgaris*)	120.2± 1.40	77.5 ± 0.34



Values are expressed as mean+ SEM. **significantly different (p<0.01) from group I (nonmotensive), *significantly different (p<0.05) from group I

Table 7: Mean of the body weight

Groups	0 weak	4th weak	6th weak	8th weak	10th weak
I	157.5± 3.5	159.8 ± 3.13	165.5± 2.76	172.5± 2.14	176.6± 1.74
II	160.8± 3.00	170 ± 2.2	182.5± 0.76**	198.8± 1.53**	224.1± 1.53**
III	158.3± 3.33	167.5 ± 3.09	81.3± 0.49**	194.3± 1.56**	232.8± 1.64**
IV	163.3± 4.41	170.8 ± 4.36	186.1± 2.24**	204.1± 3.00**	231.6± 4.41**



All Values are in mean+ SEM. **significantly different (p<0.01) from group I (nonmotensive), * significantly different (p<0.05) from group I

High fat diet (HFD) has been used to develop obesity, which is characterized with insulin resistance. HFD rats exhibited significant increase in body weight, and blood glucose level as compared to normal powdered diet. HFD for 10^{th} weeks caused obesity by increase deposition of fats in the body. In case of obesity-induced hypertension, it was observed that there was an increase in the body weight of the rats of 6 weeks. The results suggest that the increase in the body weight can indirectly lead to diabetic profile. Thus, it was confirmed by an increase in the blood glucose level. So these leads to type1 diabetic profile. Pancreatic lipase is the major enzyme responsible for the dietary fat digestion and the inhibition of enzyme, which alters the fat absorption. The study revealed that *beta vulgaris* has an inhibitory activity on pancreatic lipase enzyme. As from the phytochemical analysis it has been reported that flavonoids like luteolin demonstrates the inhibition of lipase activity.

4. CONCLUSION

Beta vulgaris, are herbacious biennial root vegetables belonging to the family Chenopodiaceae grown for their edible root. Beetroot juices are useful for reducing blood pressure and constipation. It is a well-known plant among practitioners of Traditional System of Medicine. The aerial parts were screened for its antihypertensive activity on animal models. It was found that effect of *beta vulagris* showed significant antihypertensive activity just like reference drug by significantly reducing the salt induced hypertension in rats. Individuals who are predisposed to hypertension and obesity should be very cautious and restrict their sodium intake to reduce the risk of cardiac or renal diseases. Thus it can be concluded that *beta vulgaris* proves its activity scientifically as because it is well correlated with the presence of phytoconstituent (flavonoids). The flavonoid moiety helps in breaking down the excess of fat deposition, acts by the mechanism of liposuction within the cells, and prevents CVS disorders. Thus from the results it can be said that excess of sodium can be dangerous in diets of individuals who were already overweight or hypertensive. Increased salt intake places stress on an already overworked cardiovascular system. Thus, a simple decrease in overall sodium intake would be very beneficial.

5. Declaration of Interest-

There are no conflicts of interest reported by the authors. This article's content and writing are solely the responsibility of the writers.

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