



## Comparative Study of Jalapeno Extract with Acarbose on Alpha Glucosidase Inhibition

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### ABSTRACT

Diabetes mellitus is characterized by hyperglycemia, which involves regulatory hormones such as insulin. In addition to this a mentionable enzyme alpha glucosidase also plays a vital role in carbohydrate metabolism, which in turn influences the blood glucose levels. The incidence of diabetes mellitus is increasing rapidly, it draws the necessity to develop novel anti-diabetic drugs. The present study explores the hypoglycemic property of Jalapeno extract, a pepper varience belonging to the family of *Capsicum Annuum*, which contains capsaicin predominantly. Alpha glucosidase enzyme inhibitory action was performed by UV spectroscopic analysis and the inhibitory activity of capsaicin extract was found to be 73% when compared with acarbose was found to 100%. Hence, literatures are suggestive of capsaicin owing anti-diabetic activity in diabetic mice models; this study extends to explore the anti-hyperglycemic nature of jalapeno extract by its inhibitory effect on alpha glucosidase enzyme.

**Keywords:** Alpha glucosidase; Acarbose; UV spectroscopy; Jalapenos; Capsaicin; Diabetes

### INTRODUCTION

Diabetes mellitus is a chronic debilitating metabolic disorder causing severe derangement and malfunctioning of biological enzymes leading to chronic hyperglycemia which further leads to micro and macro vascular complications. The incidence of diabetes is increasing rapidly leading to increase in mortality and morbidity in India. Diabetes mellitus is classified into type 1 diabetes mellitus and type 2 diabetes mellitus. The former is immune mediated, it destroys beta cells of pancreas and due to this, insulin production is terminated [1,2]. In type II diabetes there is lack of insulin production and insulin resistance. Alpha glucosidase enzyme is one of most important enzymes involved in degradation of carbohydrate to glucose. Thus inhibition of alpha glucosidase enzyme is an important step in the management of diabetes mellitus. Acarbose is used in the management of diabetes mellitus and its anti-diabetic activity is through inhibition of alpha glucosidase enzyme [3-5]. However acarbose has side effects like flatulence and diarrhoea. Hence the current study explores the natural plant extracts for inhibition of alpha glucosidase with less side effects. Jalapeno is a medium sized chilli pepper and belongs to the species *Capsicum annuum*. The capsaicin compound, predominantly present in the chilli is identified to have the ability to control diabetes through inhibition of alpha glucosidase enzyme [6]. Only very few literatures are available for anti-diabetic action of capsaicin, and hence the current study explores the anti-hyperglycemic nature of jalapeno extract through inhibition of alpha glucosidase enzyme [7].

## MATERIALS AND METHODS

### Sample Extraction

The Jalapenos was washed with distilled water to remove any adherent particles, shade dried and powdered. 25 gram of powdered samples were taken and extracted with ethanol using soxhlet apparatus. The extract was collected, condensed under reduced pressure in rotary vacuum evaporator and stored at 4°C.

### Materials Required

Phosphate buffer: 50 mM, pH 6.8

Sodium carbonate: (0.1 M).

PNPG: 1 mM

Sample: extract with range of concentrations 20-100 µg/ml

Alpha- glucosidase: 1 u/ml-SRL

### Procedure

Alpha-glucosidase inhibitory activity of extracts was carried out according to method of Bachhawat et al. with slight modification. Reaction mixture containing 50 µl phosphate buffer, 10 µl alpha-glucosidase and 20 µl of varying concentrations of extracts was pre-incubated at 37°C for 15 min. Then 20 µl p-nitrophenyl-α-D-Glucopyranoside (PNPG) was added as a substrate and incubated further at 37°C for 30 min. The reaction was stopped by adding 50 µl sodium carbonate. The yellow color produced was read at 405 nm. Each experiment was performed along with appropriate blanks. Acarbose at various concentrations (20-100 µg/ml) was included as a standard. Negative control without extracts was set up in parallel. The result is expressed as percentage inhibition.

### Calculation

The percentage of inhibition of alpha glucosidase enzyme by the capsaicin extract and standard drug is calculated by the formula [8-10]:

$$\text{Inhibition (\%)} = \frac{\text{Abs.control} - \text{Abs.sample}}{\text{Abs.control}} \times 100$$

### Statistical Analysis

All data were expressed as mean ± standard deviation (SD) of triplicate assays. One way analysis of variance and Turkey's multiple comparison tests were performed to determine the significant differences and the p value was found to be p<0.05 [11].

## RESULTS

Table 1: The percentage of inhibition by capsaicin

Concentration of sample (µg/ml)	% Inhibition sample	% Inhibition of acarbose
20	25	40
40	33	49
60	49	64
80	62	81
100	72	93

The above tabular column shows the percentage of inhibition by capsaicin when compared with standard drug acarbose at various concentrations of samples [12-15] (Table 1).

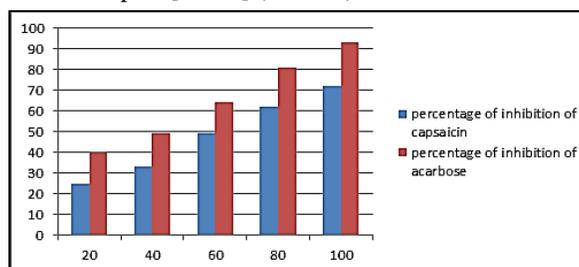


Figure 1: Concentration of sample (µg/ml)

The above chart shows the inhibitory action of jalapeno extract was found to be 25%, 33%, 49%, 62%, 72% inhibition while that of acarbose was found to be 40%, 49%, 64%, 81%, 93% at the following concentrations i.e. 20, 40, 60, 80, 100 µg/ml respectively (Figure 1).

### CONCLUSION

To summate, from the current study it is evident that the Jalapeno extract has significant alpha glucosidase inhibitory activity of 72% and acarbose has 93% at 100 µg/ml concentration. Hence this inevitably provides insight into the anti-diabetic property of Jalapeno extract. Therefore further *in vitro* and *in vivo* studies are required to establish firm anti-diabetic characteristics of Jalapeno extract. Thus this may lead to discovery of newer potential lead molecules which can serve as anti-diabetic agent.

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