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ESTIMATION OF TOTAL PHENOLIC CONTENT (TPC) OF SELECTED *ALLIUM* SPECIES OF GUJARAT USING DIFFERENT EXTRACTS

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ABSTRACT

Plants are known as a vital source for so many drugs having different groups like anticancer, antimicrobials, antioxidant etc. Therefore, there are so many plants, which are used widely by the tribal people across the world. As we know that nature can cure everything by one or another way. According to Ayurveda, plants have been known to cure various diseases like cancer, heart diseases, asthma etc. Now-a-days researchers are focusing on estimation and characterization of various plants and their constituents which are responsible for curing so many diseases according to traditional use of plants given in the Ayurveda. As we know plants are capable to produce secondary metabolites and the most important group is phenolic group. Phenolic compounds work as defense mechanism of plants against herbivores and pathogens. The present study represents the estimation of total Phenolic content of medicinally useful plants *Allium cepa* L. (Onion) and *Allium sativum* L. (Garlic) in its different extracts of bulb from selected districts of Gujarat. Chloroform was selected as non-polar solvent, acetone as polar protic and methanol and distilled water as polar protic solvent. The estimation of total phenolic content was conducted by using standard protocol. The data generated from this experiment provides basis for the advances in the pharmaceutical industries.

Keywords: Total Phenolic Content, *Allium*, Solvents, Extracts

INTRODUCTION

There are approximately 300000 documented species of higher plants on the planet, which are responsible for the production of plenty of chemicals of various groups. These chemicals, which are derived from plants, are known as phytochemicals. These phytochemicals are divided in two groups- primary metabolites and secondary metabolites. The primary metabolites are sugars, amino acids, fatty acids etc. All the chemicals, which are necessary for the growth and development of the plants, are included in primary metabolites. The secondary metabolites are different from primary metabolites and are not ubiquitous for all plants as they are not so essential for basic requirements. But they are known to be required for livelihood of plant in the environment. The secondary metabolites, most importantly plant phenolics compounds act as defense against herbivores, pathogens etc. They are also known as signal compounds as they attract pollinating or seed dispersing animals. In addition to that they protect plants from oxidants and ultraviolet radiation too (Vincenzo Lattanzio, 2013).

An onion (*Allium cepa* L.) is a plant of Liliaceae family. In all the largest grown crops it is the one. Central Asia is known as the origin of an onion (Sylvia D. Torti *et al*., 1995). It is known to play key role in reducing the risk of cardiovascular diseases, an anticancerous and also works as an antioxidant. Quercetin is a phytochemical which is present in large amount in onion. In addition to that there are so many phytochemicals which are present in onion like phenols, flavonoids and sulfur containing compounds etc (K. Shoba *et al*., 2017).

Garlic (*Allium sativum* L.) is also belongs to the Liliaceae family. Its origin is Asia. But now China, North Africa (Egypt), Europe and Mexico are also known for cultivation of garlic. It is known that this whole plant and its various parts are used as medicines, spice and food additives too. There are so many activities in which garlic plays an important part like antimicrobial, cardiovascular, anti-inflammatory and anticancer activities (Peyman Mikaili *et al*., 2013).

MATERIAL AND METHODS

Sample Selection

1. Onion

Classification (According to Bentham and Hooker's Classification System)

Kingdom: Plant

Division: Phanerogamia

Class: Monocotyledon

Series: Coronarieae

Family: Liliaceae

Genus: *Allium*

Species: cepa

Scientific Name: - *Allium cepa* L. (from Latin cepa "onion")
Common Name:-Onion (in English), Dungali (in Gujarati), Kanda-Pyaj (in Hindi)

2. Garlic

Classification (According to Bentham and Hooker's Classification System)

Kingdom: Plant

Division: Phanerogamia

Class: Monocotyledon

Series: Coronarieae

Family: Liliaceae

Genus: *Allium*

Species: sativum

Scientific Name: - *Allium sativum* L.

Common Name: - Garlic (in English), Lashan (in Gujarati), Lehsun (in Hindi)

Sample Collection

Collection was carried out from the selected districts of Gujarat. For onion, six districts were selected on the basis of popularity. They are-

1. Vankaner- Morbi,
2. Ranavav- Porbandar,
3. Tharad- Banaskantha,
4. Vadhavi- Junagadh,
5. Rajula- Amreli,
6. Himmatnagar- Sabarkantha

For garlic, three districts were selected on the basis of popularity. From Sabarkantha district, two talukas were selected to compare variability between talukas. They are-

1. Tharad- Banaskantha
2. Rajula- Amreli
3. Himmatnagar- Sabarkantha
4. Idar- Sabarkantha

Sample Preparation

The plant materials were oven dried at 50˚C, and extracted using solvents chloroform as non-polar solvent, acetone as polar protic and methanol and distilled water as polar protic solvent.

Extraction

10gm finely ground plant powder was taken and kept in 100ml solvent (Acetone, Methanol, Chloroform and Aqueous) for 24 hours. The solution was then filtered using Whatmann filter paper No.42 (125mm) and kept at room temperature for the evaporation of the respective solvents. The dried extracts were then weighed for obtaining the extractive values of each plant material.

Estimation of Total Phenolic Content (TPC)

Total phenolic content was estimated by Folin Ciocalteu's method. 1 ml of extract was taken and into it 10 ml of 1N F-C reagent was added. Then 8 ml of 7% Na_2Co_3 was added Final volume was made up to 20 ml. It was allowed to incubate for 30 min at room temperature. Intense blue color was developed. After incubation, absorbance was measured at 765 nm using UV-visible spectrophotometer. The extracts were performed in triplicates. The blank was performed using reagent blank with solvent. Gallic acid was used as standard. The calibration curve was plotted using standard Gallic acid. The data for total phenolic contents were expressed as mg of Gallic acid equivalent weight (GAE)/100 g of dry mass (Samidha K. *et al*., 2014) (Fig. 1).

Statistical Analysis

The results obtained from the experiment were analyzed statistically with Standard Deviation, Standard Error, Confidence, Correlation and T-Test.

RESULT AND DISCUSSION

Total Phenolic Content (TPC):-

For onion, the result revealed that in acetonic extract obtained Total Phenolic Content was higher in onion from Himmatnagar-Sabarkantha district than other (Fig. 3). In methanolic extract obtained Total Phenolic Content was higher in onion from Ranavav-Porbandar district (Fig. 4). In chloroformic extract obtained Total Phenolic Content was higher in onion from Vadhavi-Junagadh (Fig. 5) and in aqueous extract obtained Total Phenolic Content was higher in onion from Tharad-Banaskantha (Fig. 6). As far as the solvents are concerned Total Phenolic Content was higher in methanolic extract than others. The result was shown below (Fig. 11).

For garlic, the result revealed that in all the extracts like acetonic, methanolic, chloroformic and aqueous obtained Total Phenolic Content was higher in onion from Rajula-Amreli district than other (Fig. 7, 8, 9, 10). As far as the solvents are concerned Total Phenolic Content was higher in aqueous extract than others. The result was shown below (Fig. 11).

For the extracts prepared in all the solvents, Total Phenolic Content for the onion and garlic samples from the selected districts of Gujarat there were no similar results found from the previous experiments. So, we can consider this work new as far as the samples of onion and garlic from selected districts are concerned.

CONCLUSION

Here we conclude that for onion methanol is the best solvent for the extract preparation as it gave high amount of Total Phenolic Content than others and for garlic distilled water is the best solvent for the extract preparation. For onion, we conclude that samples from Himmatnagar-Sabarkantha, Ranavav-Porbandar, Vadhavi-Junagadh and Tharad-Banaskantha are best and for garlic, sample from Rajula-Amreli is best for future applications than others.

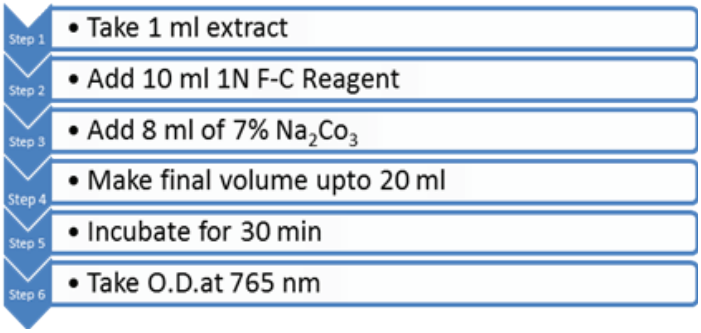

Fig.1: Flow chart represents the procedure followed for Estimation of Total Phenolic Content

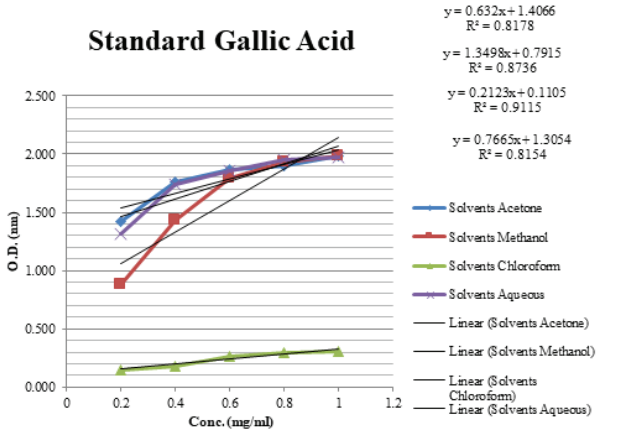

Fig.2: O.D. w.r.t. Conc. for Standard Gallic Acid (Acetone, Methanol, Chloroform and Aqueous)

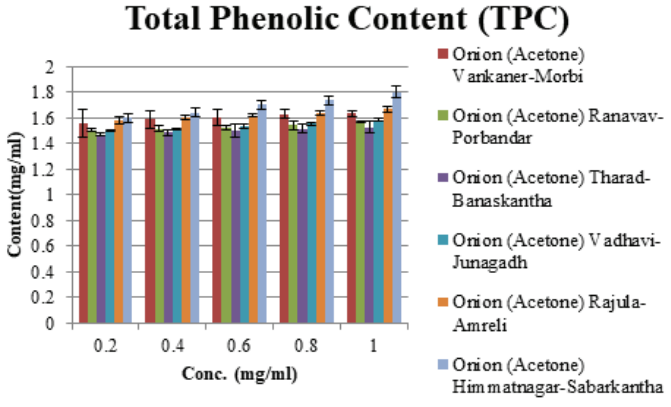

Fig. 3 Total Phenolic Content (TPC) of *Allium cepa* L. (Onion) from Different District of Gujarat (Acetone)

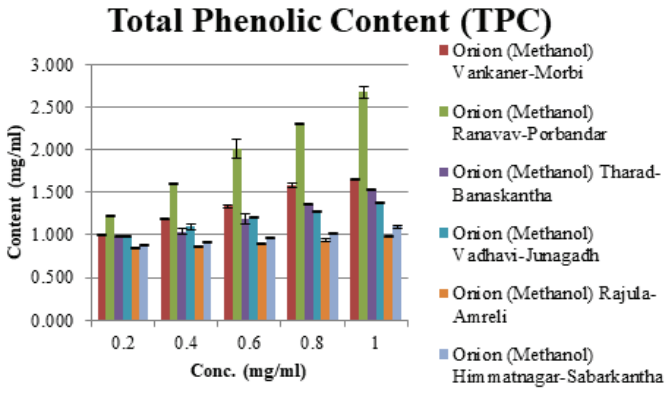

Fig. 4 Total Phenolic Content (TPC) of *Allium cepa* L. (Onion) from Different District of Gujarat (Methanol)

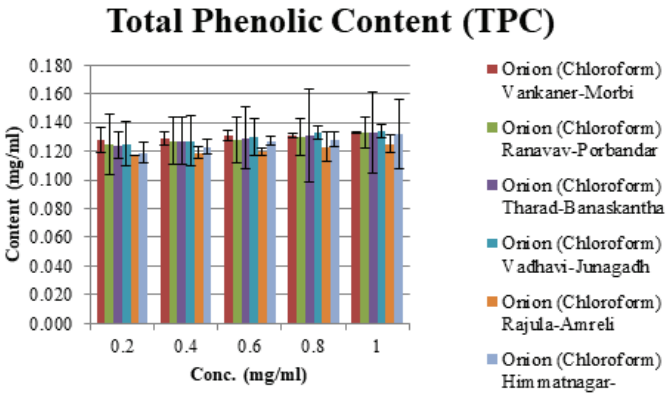

Fig. 5 Total Phenolic Content (TPC) of *Allium cepa* L. (Onion) from Different District of Gujarat (Chloroform)

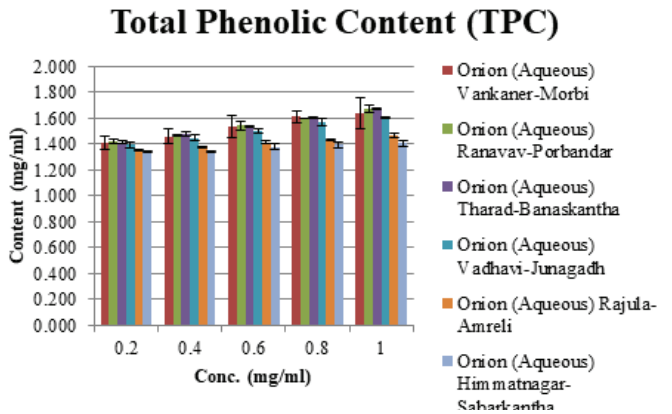

Fig. 6 Total Phenolic Content (TPC) of *Allium cepa* L. (Onion) from Different District of Gujarat (Aqueous)

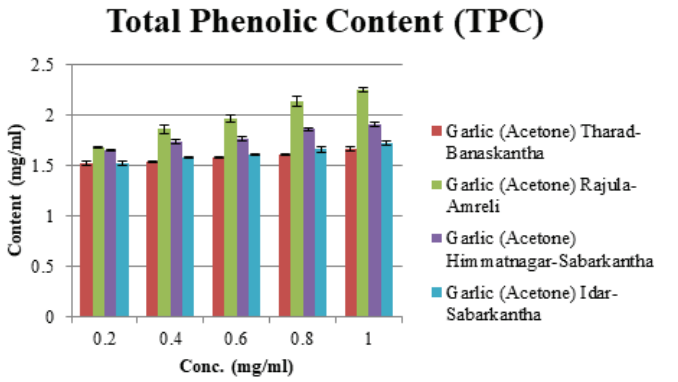

Fig. 7 Total Phenolic Content (TPC) of *Allium sativum* L. (Garlic) from Different District of Gujarat (Acetone)

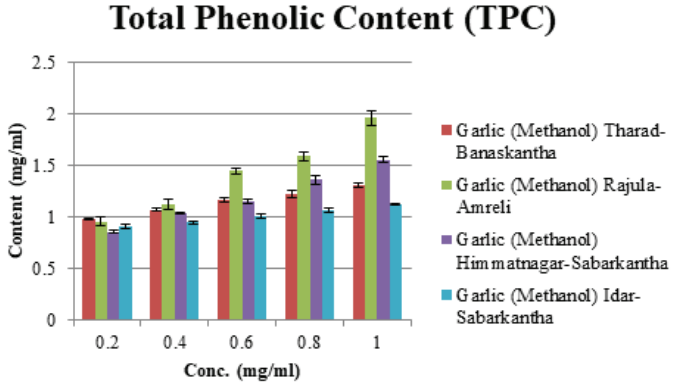

Fig. 8 Total Phenolic Content (TPC) of *Allium sativum* L. (Garlic) from Different District of Gujarat (Methanol)

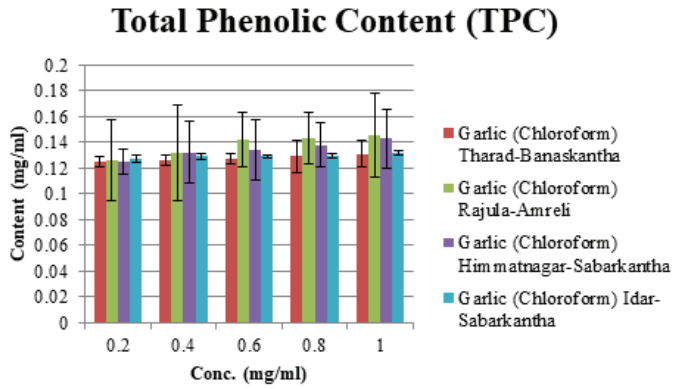

Fig. 9 Total Phenolic Content (TPC) of *Allium sativum* L. (Garlic) from Different District of Gujarat (Chloroform)

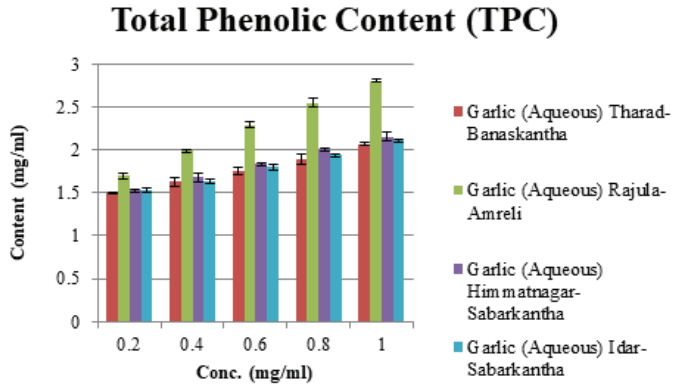

Fig. 10 Total Phenolic Content (TPC) of *Allium sativum* L. (Garlic) from Different District of Gujarat (Aqueous)

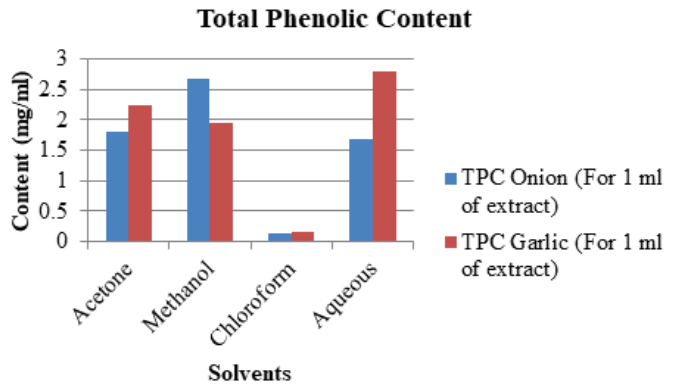

Fig. 11: Comparison of Total Phenolic Content for Different Extracts of *Allium cepa* L. (Onion) and *Allium sativum* L. (Garlic) for 1 ml of Extract

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