INTRODUCTION

Phytochemicals are complex group of primary metabolites (carbohydrates, amino acid, chlorophyll and lipid) and secondary metabolites (alkaloids, steroids, flavonoids, terpenoids, glycoside, saponin, tannins, phenolic compounds etc.). Primary metabolites are essential for plant’s growth and reproduction but secondary metabolites are not essential in it but if it present then it is responsible for particular process. Secondary metabolites are active principles that are end products of primary metabolites. The identification and isolation of such active compounds makes it more effective therapeutic application. It will lead to better understanding of diseases (Bargah RK, 2015; Nagendran B et al., 2006). A large number of diseases such as asthma, arthritis, cancer etc. can be cured not only through pharmaceuticals chemicals but also by plant based drugs without any side effects. These can also be considered as “HUMAN FRIENDLY MEDICINES” (SahiraBanu K and Cathrine L, 2015). In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought UV exposure and pathogenic attack are called as phytochemicals.

Plants produce a large variety of secondary compounds containing a phenol group which are synthesized via two different routes: the shikimate pathway and the acetate-malonate pathway. Phenolic compounds are classified into several groups, including anthocyanin, the pigments that attract animals; flavonoids, the compounds to serve as ultraviolet light protectants; isoflavonoids (phytoalexins), the compounds that act as antifungal and antibacterial defenses; lignin, the phenolic macromolecule which is involved in mechanical support and protection; and tannins, polymeric phenolic compounds that function as feeding deterrents to herbivores. Phenolic hinder oxidative degradation of lipids. That process enhances the excellence and nutritional value of food. Phenolic are responsible for so many biochemical activities such as antioxidant, antimutagenic, anticarcinogenic as well as ability of modifying gene expression (Srivastava MP et al., 2013).

Flavonoids (or bioflavonoids) (from the Latin word flavus meaning yellow, their color in nature) are a class of plant and fungus secondary metabolites. Flavonoids can be synthesized from phenylalanine. Chemically, flavonoids have the general structure of 15-carbon skeleton, which consists of two phenyl...
rings (A and B) and heterocyclic ring (c). In plants, flavonoids are responsible for the flower coloration as plant pigments which attract pollinator. It is also used in UV filtration and symbiotic nitrogen fixation and acts as chemical messengers, physiological regulators and cell cycle inhibitors (Galeotti F et al., 2008). In humans, flavonoids are responsible for antioxidant, anti-allergic, anti-cancer, anti-inflammatory and anti-viral activities (Yamamoto Y and Gaynor RB, 2001; Cazoroli LH et al., 2008; Cushnie TP and Lamb AJ, 2011; Manner S et al., 2013).

**Plant Material**

**Scientific Name:** - *Allium cepa* L. (from Latin cepa “onion”)

**Family:** - Liliaceae

**Common Name:** - Onion, Dungali, Kanda, Pyaj

Spring Onion: The plant is native to Central Asia. It is also called scallions and green variety, are young onions harvested when their tops are green and the underdeveloped bulbs are 13mm 0.5inch) or less in diameter having a mild flavor. The entire onion, including top, stem and bulb, is used raw in salads and sauces, as a garnish and as a seasoning for prepared dishes (Fig.1.1).

White variety: The plant is native to Central Asia. It has a thin, dry paper sheath with a crisp translucent pear white flesh which is pungent, savory and warm. Its barely sweet finish can be attributed to its higher moisture content than yellow onions. It is used in Mexican foods or complementing the flavors of other ingredients. It can be sauteed to a dark brown color and served to provide a sweet and sour flavor to other foods (Fig. 1.2).

Red variety: It is a native plant of Southwestern Asia. It found to flourishly grow in three distinctly different regions, Turda in Romania, Tropa in Italy and Wethersfield, Connecticut within the United States. Red onions are shallow-rooted and need a friable soil that retains moisture well, especially after cultivation (Laura G et al., 2002). They are often consumed raw, grilled or lightly cooked with other foods or added as a decoration to salads. They tend to lose their color when cooked and are available throughout the year. The red color comes from anthocyanidins such as cyanidin and it contains high amount of flavonoids. They can be stored for 3 to 4 months at room temperature. They are used in various ways like culinarilly, non-culinarily and medicinally (Fig. 1.3).

**METHODS**

Collection: Plant samples were collected from a local market near Navrangpura, Ahmedabad in the month of January 2017.

Sample preparation: The plant materials were oven dried at 50˚C, and extracted using solvents distilled water and acetone.

Extraction: 10gm finely grind plant powder was taken and kept in 100ml solvent (Distilled water and Acetone) 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 (Fig.2). Polar protic distil water and polar aprotic acetone were selected as solvents.

**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% Na₂CO₃was 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. 3).
Swati Jayswal, Ancy Fernandes and Bharat Maitreya, Estimation and Comparison of Total Phenolic Content (Tpc) and Total Flavonoid Content (Tfc) of Selected Allium Cepa L. Varieties

**Standard Graph**

The standard graph for Gallic Acid is given below

- \( y = 0.9445x + 0.0569 \)
- \( R^2 = 0.9968 \) (D.W.)
- \( y = 1.2305x + 0.0311 \)
- \( R^2 = 0.9978 \) (Acetone)

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**Estimation of Total Flavonoid Content (TFC)**

Aluminium Chloride colorimetric method (Friedman M, 2014) with some modifications was used to determine Flavonoid Content dissolved in Methanol. 1 ml of extract was mixed with 3 ml of Methanol. Then 0.1 ml of 10% \( \text{AlCl}_3 \) was added and then 0.1 ml of 1M Sodium Acetate. Final volume was made up to 9 ml. Incubated for 30 min. Then total flavonoid content was determined spectrophotometrically at 415 nm. Quercetin was used as standard and total flavonoid content was expressed in terms of Quercetin equivalent (mg/ml of extracted compound) (Fig.5).

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**Standard Graph**

The standard graph for Quercetin is given below

- \( y = 0.226x + 0.0094 \)
- \( R^2 = 0.9976 \) (D.W.)
- \( y = 0.7577x + 0.0049 \)
- \( R^2 = 0.9923 \) (Acetone)

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**RESULT AND DISCUSSION**

**Total Phenolic Content (TPC)**

The result revealed that in acetonic extract obtained Total Phenolic Content was higher than aqueous extract. This result showed that green variety had high total phenolic content in aqueous extract while red variety had low. This result was totally reversed in acetic extract as green variety had low total phenolic content and red variety had high. The result was shown below (Fig. 7 and 8).
Total Phenolic Content in the concentration of 0.2 to 1 ml of aqueous extract was found in the range of -0.013 to 0.078 for green variety, -0.022 to 0.010 for white variety, -0.005 to 0.068 for the red variety and in the concentration of 0.2 to 1 ml of acetonic extract was found in the range of 0.031 to 0.088 for the green variety, 0.109 to 0.431 for the white variety and 0.055 to 0.250 for the red variety.

DISCUSSION

For the extract prepared in the distill water Total Phenolic Content for the different onion varieties was found to be similar with the experiment performed by Xiaonan (Xiaonan Lu et al., 2011). While no results were found for the acetonic extract. TPC was found to be more in green variety compared to white variety and red variety in aqueous extract and it was found to be more in red variety compared to white variety and green variety in acetonic extract.

Total Flavonoid Content (TFC)

This result revealed that in acetonic extract Total Flavonoid Content was higher than aqueous extract. This result showed that for the aqueous extract green variety had high Total Flavonoid Content while red variety had low. For the acetonic extract Total Flavonoid Content was high in white variety while low in red variety. The result was shown below (Fig. 9 and 10).

### Comparison of Total Phenolic Content Of Allium Species

The result revealed that in acetonic extract obtained Total Phenolic Content was higher than aqueous extract. This result showed that green variety had high total phenolic content in aqueous extract while red variety had low. This result was totally reversed in acetonic extract as green variety had low total phenolic content and red variety had high (Fig. 11).
This result revealed that in acetic extract Total Flavonoid Content was higher than aqueous extract. This result showed that for the aqueous extract green variety had high Total Flavonoid Content while red variety had low. For the acetic extract Total Flavonoid Content was high in white variety while low in red variety (Fig. 12).

CONCLUSION

Estimation of Total Phenolic Content (TPC)

Here the study of Estimation of Total Phenolic Content was done using the standard protocol of Samidha et al., 2014 with some required modifications. In which we found that Total Phenolic Content is high in white variety than others and acetic extract has higher Total Phenolic Content than aqueous. Thus we can say that white variety is a good source for phenols and acetone is the best solvent for the extraction of these varieties for future purposes.

Estimation of Total Flavonoid Content (TFC)

Here the study of Estimation of Total Flavonoid Content was done using the standard protocol of Friedman M., 2014 with some required modifications. In which we found Total Flavonoid Content is high in white variety than others and acetic extract has higher Total Flavonoid Content than aqueous. Thus we can say that white variety is a good source for flavonoids too and acetone is the best solvent for the extraction of these varieties for future purposes.

References