

Optimization of physico-chemical parameters for the extraction of flavonoids and phenolic components from the skin of *Allium cepa*

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Abstract: *Allium cepa* is the most common and richest natural source of flavonoids. In this study the extraction of flavonoids quercetin and rutin and the total phenolic compounds were carried out. Optimization of physico-chemical parameters namely effects of different solvents, different solvent percentages, soaking time, different amounts of sample (Skin of *Allium cepa*) and different pH were studied. For the extraction of quercetin, the optimum results were 80% (v/v), 1d, 1% (w/v) and pH 5.5 respectively. The highest quercetin and rutin concentration for optimized conditions were 185.309 µg/L and 124.69 µg/L respectively and it was found to be 19.412 mg/L for total phenolic content.

Keywords: *Allium cepa*, quercetin, rutin, methanol, ethanol.

I.INTRODUCTION

Allium cepa (Onion) is a species consumed widely across the world and possesses a high content of flavonoid compounds (mainly quercetin and its conjugates) and sulphur compounds (i.e. thiosulphinates) [1]. Wide spectrum of biological activities makes *A. cepa* a potential therapeutic agent. *Allium cepa* has many pharmacological properties such as Anti-microbial activity, Antioxidant activity, Anti-carcinogenic activity, Anti-mutagenic activity, Anti-diabetic potential etc.

Onion is one of the most common and the richest natural source of flavonoids [2]. Among flavonoids present in the onion, quercetin is well-known major substances [3]. Reference [4] investigated the yields of onion juice and the optimal conditions of various methods to extract quercetin and its related glycosides. Though several studies on this issue were progressed with whole onions [4, 5, 6], the retrieval of helpful bioactive substances from the onion skin also has been attended as the way to utilize or evaluate the abundant parts of the resources [7,8]. Thus, the extraction methods of valuable components from the waste of onion should be worth enough to pursuit in economic point of view and environmental benefit. Here, practical methods for extracting quercetin from dried onion skin were investigated, because the most flavonoids in onion are distributed in the outer skin [9,10].

II.MATERIALS AND METHODS

A. Chemicals and reagents: Folin-Denis reagent, sodium carbonate (Na₂CO₃), Aluminum chloride, Potassium acetate, methanol, ethanol, hexane and distilled water.

B. Collection of material: Onion skin was collected from a local market at Visakhapatnam, AP. The Skin was cleaned and dried. The dried skin was powdered and used as a raw material and stored in an air tight container.

C. Preparation of the extract: Onion skin powder (0.5 g) was added with ethanol (50%) and methanol (50%) in different flasks and the volume was made 50 mL.

The solution was soaked for 1 d, 2d and 3 d respectively. After the soaking time, the solution was filtered using Whatman No.1 filter

D.Estimation of the compounds: Total phenolic content, Total flavonoid content in terms of Quercetin and rutin were estimated according to the method of Folin-Denis [11]. Quercetin was estimated according to the Aluminium chloride calorimetric assay method.

III.RESULTS AND DISCUSSION

Different organic solvents such as methanol, ethanol and water were used to extract the optimum yield of quercetin, rutin and total phenolic content from Onion skin. For quercetin, rutin and total phenolic content, methanol showed best results and the concentrations were 176.854 $\mu\text{g/L}$, 113.45 $\mu\text{g/L}$ and 17.137 $\mu\text{g/L}$ respectively. (Fig. 1).

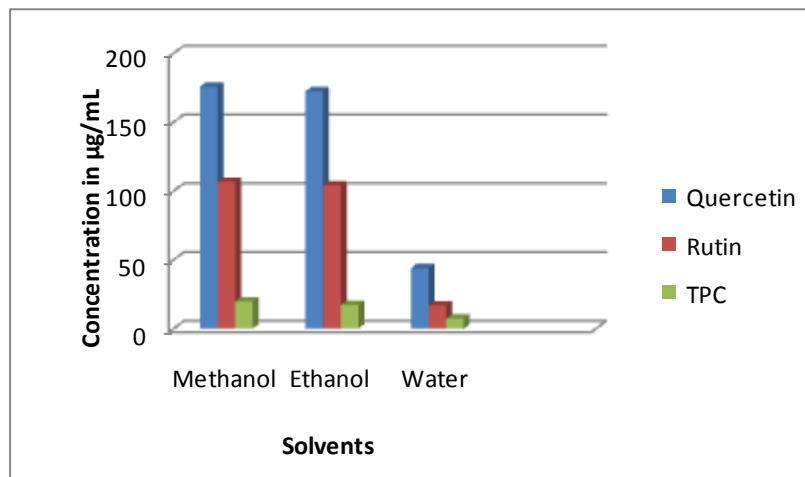


Fig. 1. Effect of different solvents for the extraction of flavonoids and phenolic components.

Percentage of the solvent plays a vital role for the extraction of components. To investigate the effect of different concentrations of solvent on extraction of quercetin, rutin and total phenolic content different concentrations were taken viz., 20%, 40%, 50%, 60%, 80% and 100%. The optimum concentrations were observed at 80% methanol and concentrations were 179.6 $\mu\text{g/L}$, 113.45 $\mu\text{g/L}$ and 17.137 $\mu\text{g/L}$ respectively (Fig. 2)

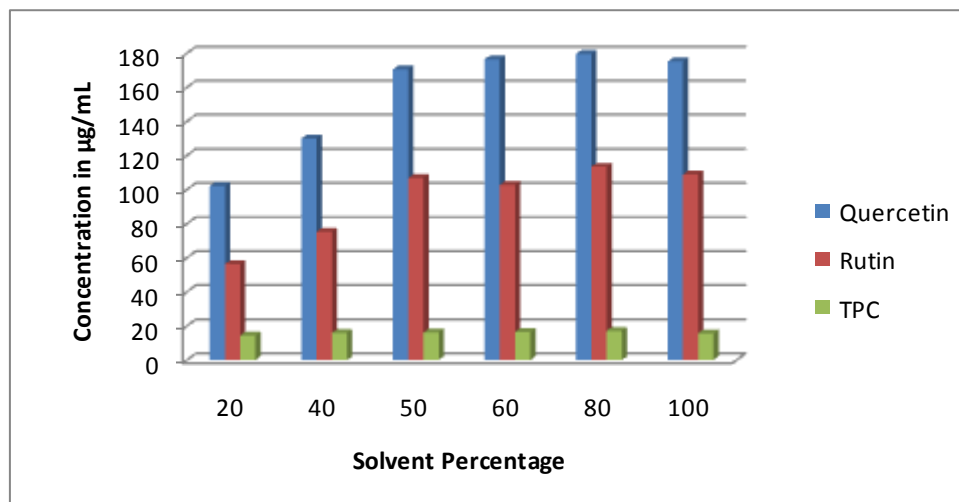


Fig. 2. Effect of different concentrations of solvent for the extraction of Flavonoids and phenolic components.

The samples were incubated under proper conditions at different time intervals viz., 1, 2 and 3 d to investigate the influence on extraction of quercetin, rutin and total phenolic content. It was observed that 1st day was the best soaking time for the extraction of quercetin, rutin and total phenolic content and the concentrations were 180.218 $\mu\text{g/L}$, 113.45 $\mu\text{g/L}$ and 17.13 $\mu\text{g/L}$ respectively. (Fig. 3).

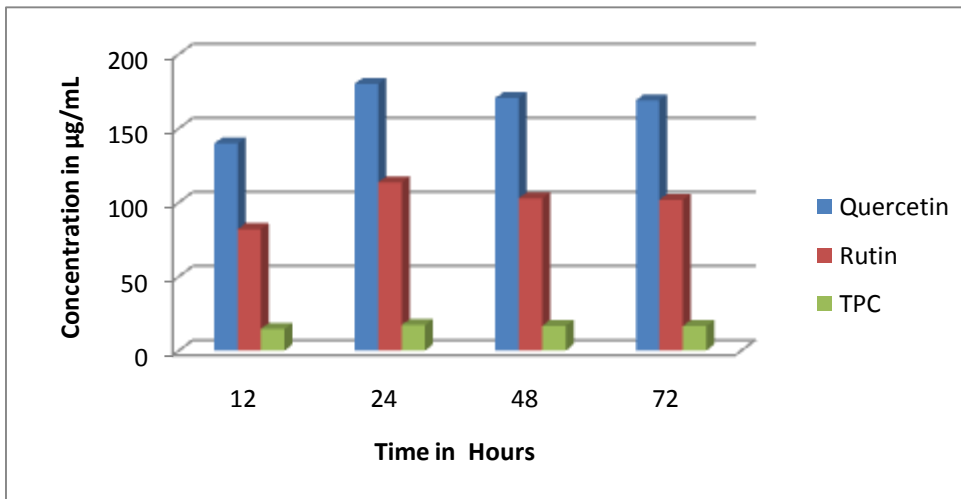


Fig. 3. Effect of soaking time for the extraction of Flavonoids and phenolic components.

Different amounts of sample (Skin of *Allium cepa*) were used to find out the optimum concentrations of quercetin, rutin and total phenolic content. The present investigation suggests that the extraction of quercetin, rutin and total phenolic at different sample amounts indicates that the optimum amount of sample to be taken was 0.5 mg/50 ml. The optimum concentrations were 183.39 $\mu\text{g/L}$, 120.96 $\mu\text{g/L}$ and 17.412 $\mu\text{g/L}$ respectively (Fig. 4)

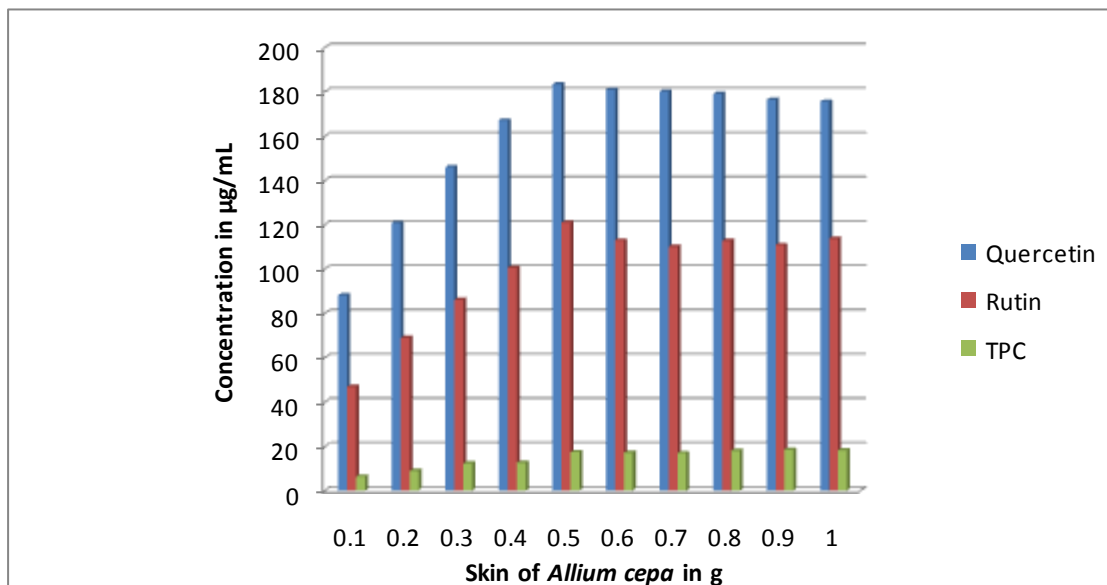


Fig. 4. Effect of different amount of sample for the extraction of Flavonoids and phenolic components.

To determine the effect of pH on the extraction process, different pH values namely 3,4,5, 6, 7, and 8 were used. It was observed that the extraction of quercetin, rutin and total phenolic content were found to be optimum at pH 5.0 and optimum concentrations were 185.309 $\mu\text{g/L}$, 124.69 $\mu\text{g/L}$ and 19.142 $\mu\text{g/L}$ respectively. (Fig. 5).

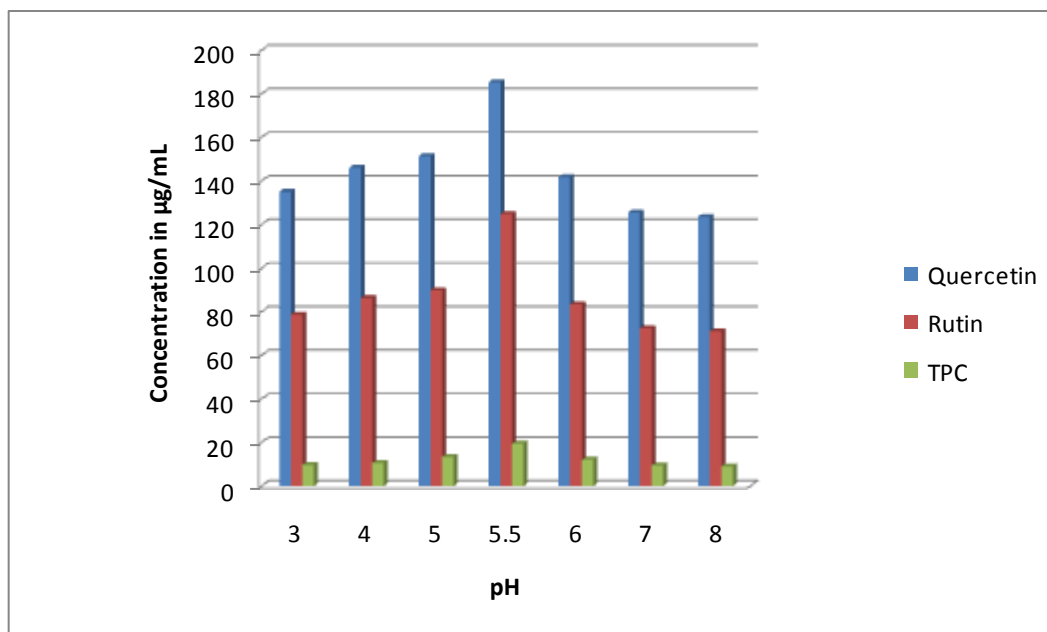


Fig. 5. Effect of different pH for the extraction of Flavonoids and phenolic components.

IV.CONCLUSION

In this study the extraction of flavonoids and phenolic components like quercetin, rutin and total phenolic content were carried out. Optimization of physico-chemical parameters namely effects of different solvents, different solvent percentages, soaking time, different amounts of *Allium cepa* and different pH for the extraction of quercetin, rutin and total phenolic were studied. For the extraction of quercetin, the optimum results were 80% (v/v), 1d, 1% (w/v) and pH 5.5 respectively. The highest quercetin and rutin concentration for optimized conditions were 185.309 $\mu\text{g/L}$ and 124.69 $\mu\text{g/L}$ respectively and it was found to be 19.412 mg/L for total phenolic content. From the results obtained, the skin of *Allium cepa* is one of the major source of flavonoids.

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