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Research Article

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## Effect of Fertilizer on the Nutritive Value of Leaves of *Allium cepa var aggregatum*

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### ABSTRACT

The fertility of soil as well as the nutritional composition of the plants grown in the agricultural fields is improved both by the usage of organic fertilizers and inorganic fertilizers. Organic farming is considered as the oldest agricultural practice whereas inorganic fertilizers are developed to meet the global food demand. Organic fertilizers are ecofriendly with long term effect. *Allium* and its parts are included in the diet by almost all the people in the world. *Allium* possess antibacterial, antiviral, antifungal activities, antimutagenic and antidiabetic properties. In this present study the carbohydrate, protein, lipid content and minerals like iron, calcium, phosphorous were estimated and compared in the leaves of *Allium cepa var aggregatum* grown in organic and inorganic fertilizers. Qualitative phytochemical analysis was also carried out. The carbohydrate and protein content is found to be increased in the leaves supplied with organic fertilizer. The iron content is increased 6 times in leaves grown in organic fertilizer when compared to inorganic fertilizer. Calcium and phosphorus levels were also elevated in leaves grown in organic fertilizer. The experimental results of the study show that organic fertilizer produces higher nutritional values on leaves of *Allium* when compared with inorganic fertilizer.

**Keywords:** Allium, Organic fertilizer, Nutrients, Red shallot, Phytochemicals

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### 1. Introduction

Nutrients are generally required by the plants for its growth. In agricultural practice soil nutrients are supplied in the

form of organic and inorganic fertilizers. Organic farming is considered as the oldest practice whereas artificial

fertilizers came into use only after industrial revolution [1]. To meet the global food demand the world's agriculture relies on artificial fertilizers. They are easy to use, quickly absorbed by the plants but the soil structure is affected on continuous usage of inorganic fertilizer. Organic wastes are rich in plant nutrients (2) which improve the physical and chemical properties of soil that are important for plant growth [3]. Hence organic fertilizers are used as alternative to mineral fertilizers (4) for improving soil structure [5], microbial biomass (6). *Allium* is a large genus with around 400 species and is cultivated for food worldwide [7]. Organic manure of a soil increases the nutrients status and thereby the yield of onion is increased [8]. The nutrition profile of shallot is better than onions. They are found to have several fold more concentration of vitamins and minerals than onions. Shallots possess antibacterial, antiviral and antifungal activities. Red Shallots are also a rich source of flavonoid antioxidants such as quercetin, kemferol. Studies show that *Allium* and allyl disulfide compounds possess antimutagenic and antidiabetic properties. Allicin reduces Cholesterol and blood pressure levels. The aim of the present study is to compare the effect of organic and inorganic fertilizers on the carbohydrate protein and lipid levels and also on the mineral contents such as iron, calcium and phosphorus in the leaves of *Allium cepa var aggregatum*.

## 2. Experimental

### Collection of Sample

Red shallots were purchased from local vendor without any external defects. The outer skin is peeled and washed under running tap water. The Red shallots were then planted in separate pots containing soil and organic, soil and inorganic fertilizer mixture. Watering is done daily and after 10 days the leaves were collected and the nutritive values assessed.

### Estimation of Carbohydrate

100 mg of leaves are homogenised in a mortar and pestle using 5ml of 2.5N HCl and heated in a boiling water bath for 3 hours. The homogenate is then cooled to room temperature and neutralized with sodium carbonate till effervescence stops. The volume is made up to 100ml with distilled water, then centrifuged. The amount of carbohydrate in the supernatant is estimated using glucose as standard by anthrone method [9].

### Estimation of Protein

100 mg of leaves are homogenised in a mortar and pestle and 5ml of 10% TCA is added, kept at 0°C for 30 minutes and centrifuged. The pellet is then dissolved in 5ml of 0.1N NaOH and the protein content was estimated using Bovine serum albumin as standard by Lowry's method [10].

**Estimation of Lipids:** The lipid content in the leaves was estimated by Bligh and dryer method.

### Estimation of Iron

1g of leaf sample is weighed and kept in muffle furnace for 5 hours. The ash is then dissolved in 0.1N HCl and made upto 100 ml with distilled water in a standard flask. The iron content was estimated by Ramsay's method [11].

### Estimation of Calcium

1g of leaf sample is weighed and kept in the muffle furnace, till it gets charred, few drops of concentrated

nitric acid is added and kept again in the furnace for an hour at 600 to 900°C. A pale white ash obtained is dissolved in few drops of 0.1N HCl and the solution is made up to 100ml with distilled water in a standard flask. Twice the volume of ammonium oxalate was added drop by drop to the solution and kept overnight for calcium to be precipitated as calcium oxalate. The solution is then filtered and then washed with ammonium hydroxide each time. After washing the precipitate is dissolved in 2N H<sub>2</sub>SO<sub>4</sub>, and the liberated oxalic acid is then titrated against potassium permanganate. From the titre value the amount of calcium in the sample is calculated.

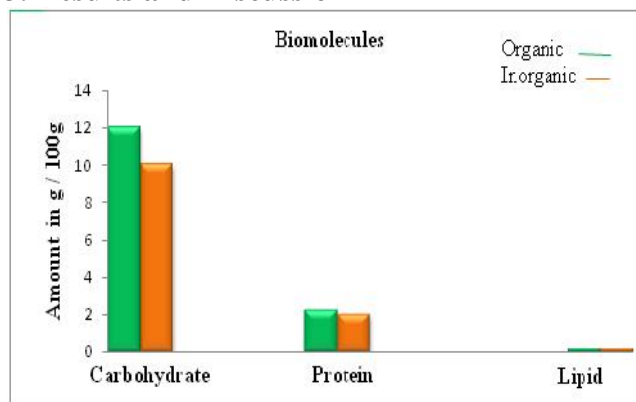
### Estimation of Phosphorous

1g of leaf sample is weighed and ashed in a crucible with the addition of a drop of concentrated nitric and kept in the muffle furnace for 3hours at 600°C. The fine white ash obtained was dissolved in 100ml of 0.1N HCl. The phosphorus content was estimated by Fiske and Subarow method [12].

### Phytochemical Analysis [13]

Phytochemical screening was carried out on leaves of *Allium cepa var aggregatum* using standard procedures to identify the constituents by the method of Sofowora Trease and Evans [14] and Harborne [15].

## 3. Results and Discussion



**Figure 1:** Graphical representation of effect of organic and inorganic fertilizers on biomolecule levels on leaves of *Allium cepa var aggregatum*

Carbohydrate content in *Allium cepa var aggregatum* leaves grown in organic fertilizer was found to be 12g. Carbohydrates are considered as the good source of energy. Though the availability of carbohydrate is more in normal diet, cereals and other food grains rich in fibre and other nutrients are preferred. There is no specific dietary requirement of carbohydrate but 50g is enough to prevent the breakdown of body's store of protein and fat [16]. The protein content is increased by 0.2 g in the *Allium cepa var aggregatum* leaves grown in organic fertilizer. Proteins in the diet supply the necessary amino acid for the body and also play an important role in all the biological process such as synthesis of hormones, nerve impulse transmission, muscle movement and many more. There is no alteration in the levels of lipids content in the *Allium cepa var aggregatum* leaves grown in organic and inorganic fertilizer. Lipid content was found to be 0.2 g in both the

results on the mineral composition such as iron, calcium and phosphorus in *allium* leaves is shown in table 1. The iron value was found to be increased by 6 times in the *Allium cepa* var *aggregatum* leaves grown in organic than inorganic *allium* leaves. Iron is required for the supply of oxygen throughout the plant system.

**Table 1:** Mineral composition (mg / 100g)

S.No	Minerals	Organic <i>allium</i> leaves	Inorganic <i>allium</i> leaves
1	Iron	6	1
2	Calcium	30	24
3	Phosphorus	40	26

**Table 2:** Comparative studies on the effect of organic and inorganic fertilizers on phytochemicals

Phytochemicals	Organic sample	Inorganic sample
Phytochemicals	+	+
Tannin	+	+
Phlobatonin	+	+
Saponin	+	+
Flavonoid	+	+
Steroid	+	+
Terpenoid	+	+
Phenol	+	+
Cardiac glycosides	+	+
Amino acid	+	+

Qualitative Phytochemical analysis result is presented in table 2

Calcium and phosphorus levels were 30 mg and 40 mg respectively in organically grown *allium* leaves. Calcium plays a major role in the plant growth. Phosphorus serves as energy currency. It plays role in photosynthesis, respiration, promotes root formation and improves the quality of fruits and vegetables.

Phytochemicals such as tannin, saponin, flavonoid, steroid, terpenoids, phenol, cardiac glycosides and amino acids are found in *allium* leaves grown in organic and inorganic fertilizer. The active constituents in the leaves may be responsible for the development of various drugs to treat diseases.

#### 4. Conclusion

It has been known that consumption of organic food is more nutritious compared to food grown otherwise. Earlier research findings also state that tomatoes, potatoes, onion, wheat grown by organic farming has 20- 47% more nutrients than ones grown using inorganic fertilizers. This experiment confirms the same. The results of the present comparative study on the effect of the application of organic and inorganic fertilizers, clearly indicate an increase not only in the concentration of biomolecules (Carbohydrate, Protein) and minerals but also in the phytochemical composition of the leaves of *Allium*. *Allium* leaves are also equally nutritious as the *allium* bulbs and can be included in our food. Through this study the

significance of using organic fertilizer for enhanced nutritional value of food is further strengthened.

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