

Heavy metal screening in leaves of *Talinum portulacifolium* (Forssk.)Asch. ex Schweinf. using atomic absorption spectroscopy (AAS)

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Abstract: *Talinum portulacifolium* (Forssk.) Asch. ex Schweinf. is an edible, perennial, herbaceous leafy vegetable that belongs to the Talinaceae family. It has a high range of medicinal uses with high nutritional value. Generally green leafy vegetables are good source of vitamins and minerals. Leaves are excellent in carotenes, low in carbohydrate and energy but they are good source of beta-carotene, calcium, riboflavin, folic acid, ascorbic acid, iron, vitamin K etc. Atomic Absorption Spectroscopy of *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf. unveiled the presence of Phosphorus, Copper, Iron, Calcium, Lead, Manganese, Magnesium and Zinc. Essential minerals such as Magnesium, Calcium, Iron and Zinc are found in large amount which is essential for the prevention of deficiency diseases and normal health of human being. It is highly nutritional; and can be used to overcome malnutrition. *Talinum portulacifolium* (Forssk.) Asch. ex Schweinf is cheaply available and is a good food supplement.

Keywords: *Talinum portulacifolium*; Atomic Absorption Spectroscopy; heavy metal analysis.

I. INTRODUCTION

Talinum portulacifolium (Forssk.) Asch.ex Schweinf is a perennial, herbaceous plant with grey, succulent stems that sprout from a thickened root that is sometimes creeping, which belongs to the Talinaceae family. The stems, which can sometimes become softly woody, usually grow up to 1 meter long, occasionally to 3 meters. The plant is gathered from the wild for local use as a food and medicine. The plant is used as vegetable or added to salads. Leaves, fruits and young stem are used for cooking. The leaves can also be stored dry for later use. The leaves are used in the treatment of eye disease. A decoction is used as remedy for constipation. The root is used in the treatment of coughs and gonorrhoea. The plant is credited with aphrodisiac properties. Most leafy vegetables are very rich in phytonutrients and a host of antioxidants which assure a normal progression of the metabolic process of the body. Protein and carbohydrates are important nutrients for existence.[1]

Protein is essential for nutritive assessment. All the fractions (cellulose, lignin, hemicellulose, pectin, gums and mucilage) of dietary fiber play a significant job of many disorders such as diabetes, constipation, diverticulosis, cardiovascular diseases, and fatness [2]. Atomic absorption spectroscopy (AAS) is a technique for measuring quantities of chemical elements present in environmental samples by measuring the absorbed radiation by the chemical element of interest. Atomic absorption methods measure the amount of energy in the form of photons of light that are absorbed by the sample.

The Atomic Absorption Spectroscopic study in *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf is to determine the metal composition. Several trace elements have toxic effects and some of them could decrease the stability of active

ingredients even at ultra-trace concentration. Lead (Pb), cadmium (Cd), and mercury (Hg) are potential for toxicity and pose the risk of serious health hazards even at very low toxic at lower concentration. Leafy green vegetables are an important part of a healthy diet. They are packed with vitamins, minerals, and fibre but low in calories. Eating a diet rich in leafy greens can offer health benefits including reduce deficiency diseases, obesity, heart disease, high blood pressure and mental decline. The leaves are the essential and most nutritious part of the plant, being a significant source of vitamin B1, vitamin C, vitamin B3, potassium, pro vitamin A as beta carotene and protein. Most leafy vegetables are very rich in phytonutrients and a host of antioxidants which assure a normal progression of the metabolic process of the body. Nutrients play a central task in rewarding human requirements for energy and life processes [3].

II. MATERIAL AND METHODS

Material: For the present investigation, samples of *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf were collected and cultivated at normal climatic conditions. The plant was identified using the “Flora of Presidency of Madras Volume 1” by James Sykes Gamble [4]. Heavy metal content present in the plant was identified through Atomic Absorption Spectroscopy. Samples are stored in tight sealed pack and analyzed within a day.

Methods: The whole sample is mixed well and a portion is blended to fine powder. Calibration is done by aspirating standard metal solutions and noted the absorbance. using A.O.A.C. International 20th Edition 2019 (3.2.05)

Preparation of sample and extraction : 1 to 3 g of well ground mixed sample is weighed into a pre weighed crucible and heated for overnight at 500 degree centigrade and let cool. Wet ash with 10 drops water and 1-2ml nitric acid is carefully added. Evaporated excess nitric acid on a hot plate set at approximately 100 degree centigrade. Returned crucible to furnace and heated for 1 hour at 500 degree centigrade. Ash is dissolved in 10ml HCl, filter to volumetric flask and made up to 10ml with distilled water. Read the concentration by aspirating sample and reference standard solution in Atomic Absorption Spectroscopy.

III. RESULTS AND DISCUSSION

Talinum portulacifolium (Forssk.) Asch.ex Schweinf belongs to family Thalineeae is one of the most important vegetable and medicinal plant. Vegetable crop species are vital sources of raw material for pharmaceutical industries and modern-day naturopathic based human therapeutics. Systematic analysis of the macro and micro mineral elements thus facilitates evaluation of nutritional composition and minerals accumulated by the edible plants [5]. Lifestyle-related diseases are associated with the diet. Some human health diseases are often genetic, but there is a definite interplay of disease with contributions arising from consumption of certain commonly used foods [6]. Adequate amount of nutrients in diet helps to maintain health and balance of body.

Atomic Absorption Spectroscopy of *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf unveiled the presence of Phosphorus, Copper, Iron, Calcium, Lead, Manganese, Magnesium and Zinc. The daily mineral requirement of an adult man (a 70kg person) is 15 mg Iron, 2.8 mg Manganese, 2.5-4.5 mg Phosphorus, 15mg Zinc, 2.5mg Copper, 0.025mg Nickel, 0.05-0.2 Chromium, 0.415mg Lead and 0.057mg Cadmium [7]. A number of these elements have been reported with high biochemical essence and are involved in up regulating the formation of secondary metabolites which are responsible for pharmacological action of vegetal species [8]

The amount of phosphorus present in *Talinum portulacifolium* (Forssk.) Asch. ex Schweinf is 0.1g/100g leaves. Phosphorus play an important structural role in nucleic acid and cell membrane and it involved in energy production. Phosphorus levels that are too high or too low can cause medicinal complications, such as heart disease, joint pain, or fatigue. Copper is an essential nutrient for our body. Together with iron, it enables the body to form red blood cells. It helps maintain healthy bones, blood vessels, nerves and immune function. It contributes to iron absorption. Sufficient copper in the diet may help to prevent cardiovascular disease and osteoporosis. Copper content in *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf leaves is 7.4mg/kg. Iron content in the leaves shows 107mg/kg. The main role of iron is to help our red blood cells transport oxygen to all parts of the body. The deficiency of iron causes anemia. Iron is actively involved in preventing disorders like anemia and cough associated with angiotensin converting enzyme (ACE) inhibitors [9] while hyper accumulation of Iron can lead to hepatic megal, cardiac infraction, nephric malfunction [10] etc.

Calcium content in *Talinum portulacifolium* (Forssk.) Asch.exSchweinf leaves is 3614mg/kg. Calcium is one of the most important minerals for the human body. It helps form and maintains healthy teeth and bones. A proper level of calcium in the body over a lifetime can help prevent osteoporosis and it also help in muscle contraction and blood clotting. Young children are particularly vulnerable to the toxic effect of lead and can suffer profound and permanent adverse health effects, [11]. The amount of manganese is 29.3mg/kg. Without adequate dietary manganese, many chemicals processes in our body may not function properly. Manganese and Iron play vital role in the biochemical processes, improvement of in paired glucose tolerance and have indirect role in the management of diabetis mellitus [12]. Magnesium concentration were highest followed by Calcium 4535mg/kg, 3614 mg/kg respectively. Calcium assimilate into the bone and plays a role in activating vitamin D, it is also essential for healthy bones. Optimal magnesium intake is associated with greater bone density, improved bone crystal formation, and a lower risk of osteoporosis in women after menopause. Cadmium is not detected in *Talinum portulacifolium* (Forssk.) Asch.exSchweinf.. Zinc is known to be a mobile element [13].The amount of Zinc present in *Talinum portulacifolium* (Forssk.) Asch.exSchweinf leaves is 43.1 mg/kg. Manganese concentration is 29.3 mg/kg which helps in the metabolism of our body Lead is found in trace amount. Our health is very much dependent to our balanced meals.

The quantitative investigation using atomic absorption spectroscopic technique shows the presence of Calcium, Phosphorus, Copper, Iron, Magnesium, Manganese, Lead and Zinc elements in the leaves of the plant. The concentration of Magnesium and Calcium were found very high in *Talinum portulacifolium* (Forssk.) Asch.exSchweinf. The most dangerous heavy metal Cadmium was not detected in the study. The body needs different kinds of minerals for its proper functioning. The investigation shows that *Talinum portulacifolium* (Forssk.) Asch.exSchweinf is an ideal food for the balance of minerals in human body. Chemical analysis of *Talinum portulacifolium* (Forssk.) Asch.exSchweinf by atomic absorption spectroscopy was represented in Table 1. Calibration is done by aspirating standard metal solutions and noted the absorbance using A.O.A.C. International 20th Edition 2019 (3.2.05)

Table 1: Chemical analysis of *Talinum portulacifolium* (Forssk.) Asch.exSchweinf leaves by atomic absorption spectroscopy

SL NO	PARAMETERS	RESULTS	UNIT
1	Phosphorous	0.1	g/100g
2	Copper	7.4	mg/kg
3	Iron	107	mg/kg
4	Calcium	3614	mg/kg
5	Lead	3.8	mg/kg
6	Cadmium	Not detected (Det.Limit:0.5)	mg/kg
7	Manganese	29.3	mg/kg
8	Magnesium	4535	mg/kg
9	Zinc	43.1	mg/kg

IV. CONCLUSION

Talinum portulacifolium (Forssk.) Asch.exSchweinf contains elements of vital importance in human metabolism that are needed for growth, development, prevention and treatment of many diseases. The high concentration of certain metals, Magnesium, Potassium, Calcium and Iron in the plants are essential for proper growth and normal functioning of the human body. It is cheaply available and is widely used against anemia and malnutrition. The plant contains elements of vital importance in human metabolism that are needed for growth, development, prevention and treatment of many diseases. The trace elements present in this species may play a direct or indirect role in their biological activities. The addition of *Talinum portulacifolium* (Forssk.) Asch.exSchweinf leaves in our daily diet can help to improve overall health and well-being. This study shows *Talinum portulacifolium* (Forssk.) Asch.ex Schweinf leaves can play a significant role to improve the health and nutrition particularly in malnourished populations. The present study also indicates the

importance of adding *Talinum portulacifolium* (Forssk.) Asch.exSchweinf leaves in our daily diet, as it is cheaply available and easy to cultivate in all houses. The trace elements present in this species may play a direct or indirect role in their biological activities. This study shows *Talinum portulacifolium* leaves can play a significant role to improve the health and nutrition particularly in malnourished populations. It also indicates the importance of adding *Talinum portulacifolium* leaves in our daily diet, as it is cheaply available and easy to cultivate in all houses

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