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Exploring Computational Evaluation of Nutritional Contents from Green Veggies

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Abstract: ***Deficiency of proteins, vitamins and minerals is a major nutritional constraint of good health. Marasmus and kwashiorkor diseases are the consequences of protein malnutrition in children. In developing countries like India the increasing demand of proteins can be met by the use of leaf proteins extracted from green leafy vegetables. Seven plants spinach, coriander, Fenugreek, Safflower, Portulaca, Tandulaja and Rumex (Chuka) were cultivated and tested for their nutritional quality. The technique of green crop fractionation was applied in selected green leafy vegetables and it was studied comparatively for good quality of leaf proteins. Since Plant leaves have vitamins, minerals and essential amino acids and when consumed in adequate amounts they can supplement protein to a body.***

Keywords: Green crop fractionation (GCF), pressed crop residue (PCR), leaf protein concentrate (LPC)

1. Introduction

Green vegetables are rich source of Ca, P, Fe and the green leaves contain proteins, lipids, carbohydrates etc. In the developing countries due to increasing population, the need of proteins can be met by some non- conventional method. Numerous technologies have been developed over last 50 years to separate leaf proteins from the fibrous material. The leaf extracts contains proteins, lipids, sugars, salts and vitamins. When the juice is heated to over 80^0C, green protein rich curd is obtained. It is referred to as leaf protein concentrate (LPC). This can be separated from deproteinised juice by filtration through cotton cloth. Thus, green foliages can be fractionated mechanically into three fractions as,

1) Fibrous pressed crop
2) Leaf protein concentrates (LPC)
3) Deproteinized juice [1, 2]

During green crop fractionation the dry filtrate left after the extraction of juice is called as pressed crop residue (PCR). This PCR is known as fibrous residue, which still contain from 9 to 16 % crude protein (CP; N x 6.25) in its dry matter (DM) depending on the species used for fractionation. This can be successfully used as a feed for cattle [**3, 4]** Leaf protein concentrate (LPC) contain from 40 - 70 % protein (on DM basis) along with appreciable quantities of β - carotene (pro - vitamin A), vitamin E and minerals. The LPC can be used as a protein vitamin - minerals supplement in poultry, calf or even human nutrition [**2**, **5]**.

De - protenized juice (DPJ) contains soluble components of the plant cell. It is considered as a by - product of green crop fractionation **(**GCF) system. This fraction can be used along with PCR in animal nutrition [**4]**, for irrigation as a fertilizer source [**6, 7]** or for growing useful microorganisms [**2, 8, 9].**

Present investigation demonstrates the extraction of cytoplasmic and chloroplastic protein nutrients from green leafy vegetables commonly found in local areas.

2. Materials and Methodology

Accurately 100gm foliages were weighed on scientific weighing balance. The leaves were pulped using mortar and pestle and subsequently pressed by exerting pressure with the help of musclin cloth on the pulp. Extracted juice by pressing was collected and measured. The amount of juice and pressed crop residue left after fractionation were recorded.

For preparation of LPC Pirie method of heat coagulation is widely accepted. A sample of 100ml juice was taken.20 ml of water was boiled in a beaker; 100ml juice was added to it with stirring heated up to 95°C. As a result of heating the LPC is formed. To prepare a green chloroplast and white cytoplasmic LPC, the juice was heated to 60 degrees for 5 minutes and filtered through whatman filter paper. Both the samples were dried in an oven to measure the yield of total LPC, chloroplast and cytoplasmic LPC per 100 ml of juice. The pH of the juice of all veggies was measured. The amount of chloroplastic protein was estimated following Yoshida et al (1976**) [12].** Statistical analysis of all samples was done following Panse and Sukhatme (1978) and Mungikar (1997**) [13]**

Green Crop Fractionation (GCF)

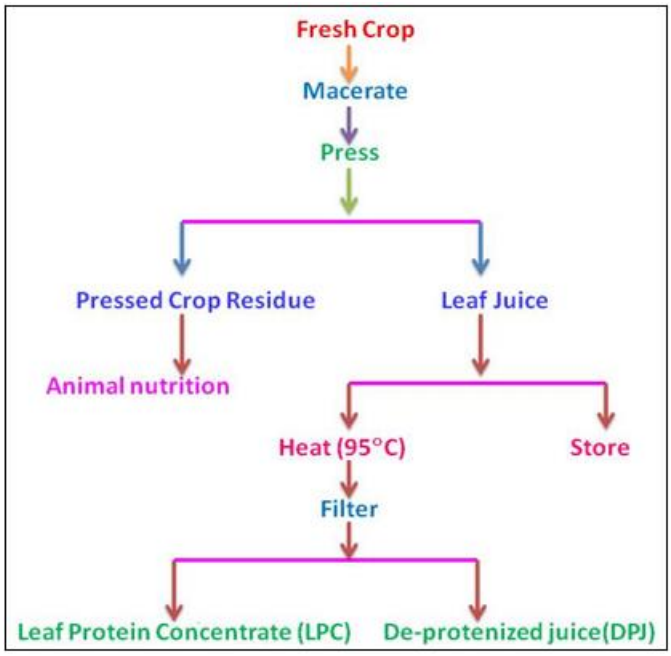

Figure 1: Process of LPC determination

3. Results and Discussion

The leafy vegetables are most suitable for preparation of LPC. These samples were found to be nutritious containing appreciable amount of protein along with mineral and vitamins.

The quantity of juice, the amount of Pressed Crop Residue (PCR) and pH are presented in **Table 1.**

Table 1: Proportion of juice, the amount of Pressed Crop Residue (PCR) and pH

S. N.	Leafy vegetable	Leaf juice in ml /100 gm	PCR/ 100 gm	pH
1	Spinach	80.00	20.00	7.40
2	Coriander	40.00	55.00	5.80
3	Fenugreek	70.00	30.00	6.00
4	Safflower	65.00	35.00	5.80
5	Portulaca	80.00	25.00	6.40
6	Tandulaja	70.00	25.00	5.80
7	Chuka	80.00	15.00	7.20

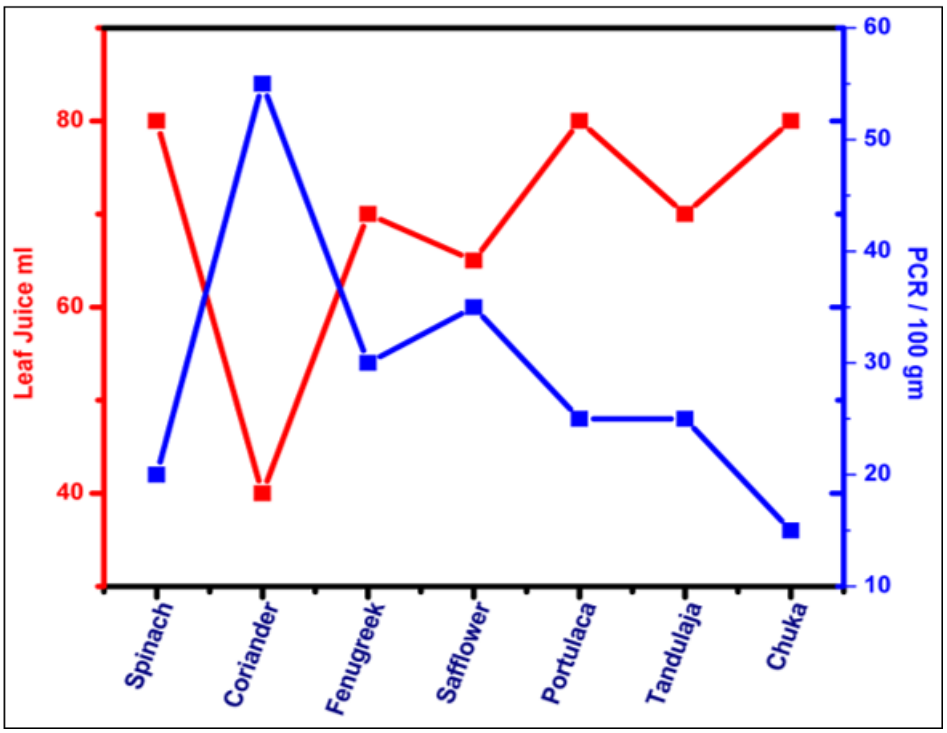

Figure 2: Pressed Leaf juice proportion/100 gm vegetable and PCR /100 gm vegetable

Spinach, Portulaca and Chuka yields maximum leaf juice and minimum PCR while coriander yields minimum juice and maximum PCR as shown in **Fig.2.**

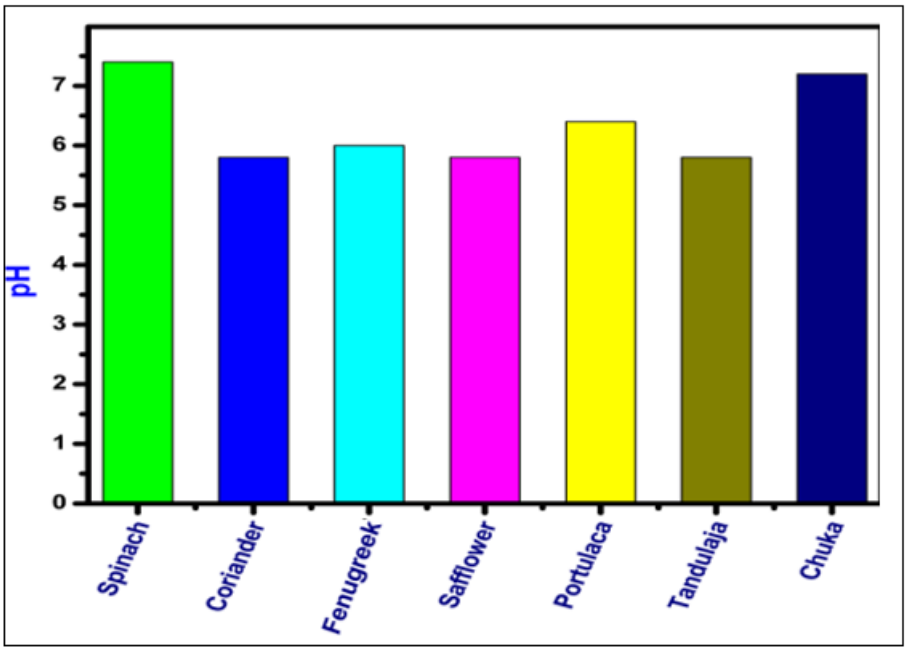

Figure 3: pH of Presed Leaf juice

Coloumn chart in **Fig.3** shows that Spinach have highest pH (7.4) followed by Chuka (7.2) and Fenugreek (6) whereas Tandulaja, Safflower and coriander showed lowest pH (5.8).

Table 2: Yield of LPC divided into chloroplastic and cytoplasmic protein

S. N.	Leafy Vegetable	% Dry matter	Chloroplastic C1	Cytoplasmic C2	Total LPC = C1 + C2
1	Spinach	5.5	3.00	0.04	3.34
2	Coriander	3.00	2.56	0.32	2.89
3	Fenugreek	9.00	6.29	0.69	6.99
4	Safflower	6.00	5.85	0.35	6.20
5	Portulaca	6.50	3.95	0.25	4.20
6	Tandulaja	5.50	5.70	0.30	6.00
7	Chuka	5.00	4.76	0.24	5.00

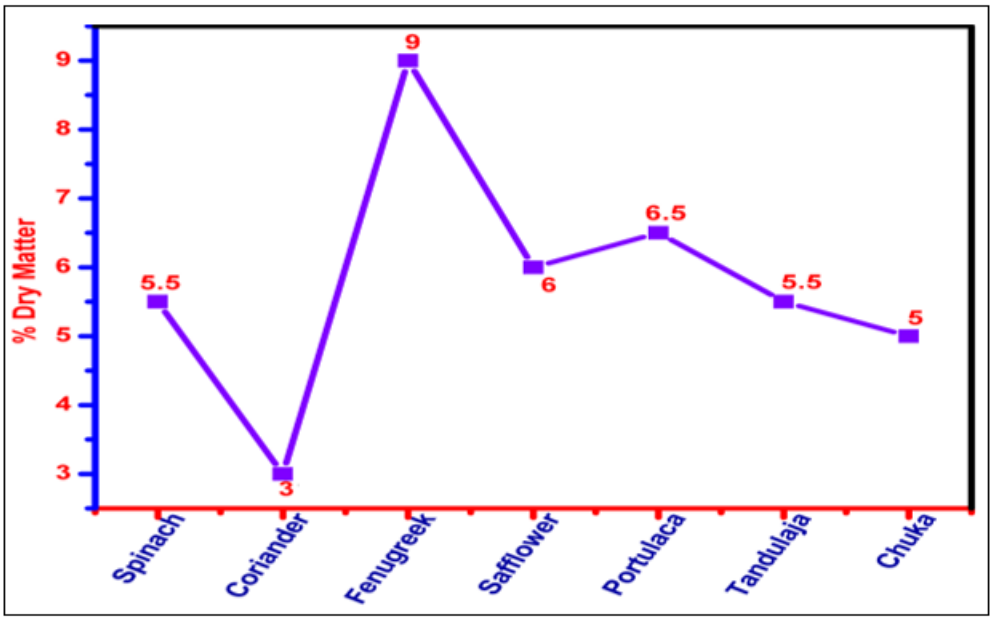

Figure 4: Dry matter proportion in seven vegetables

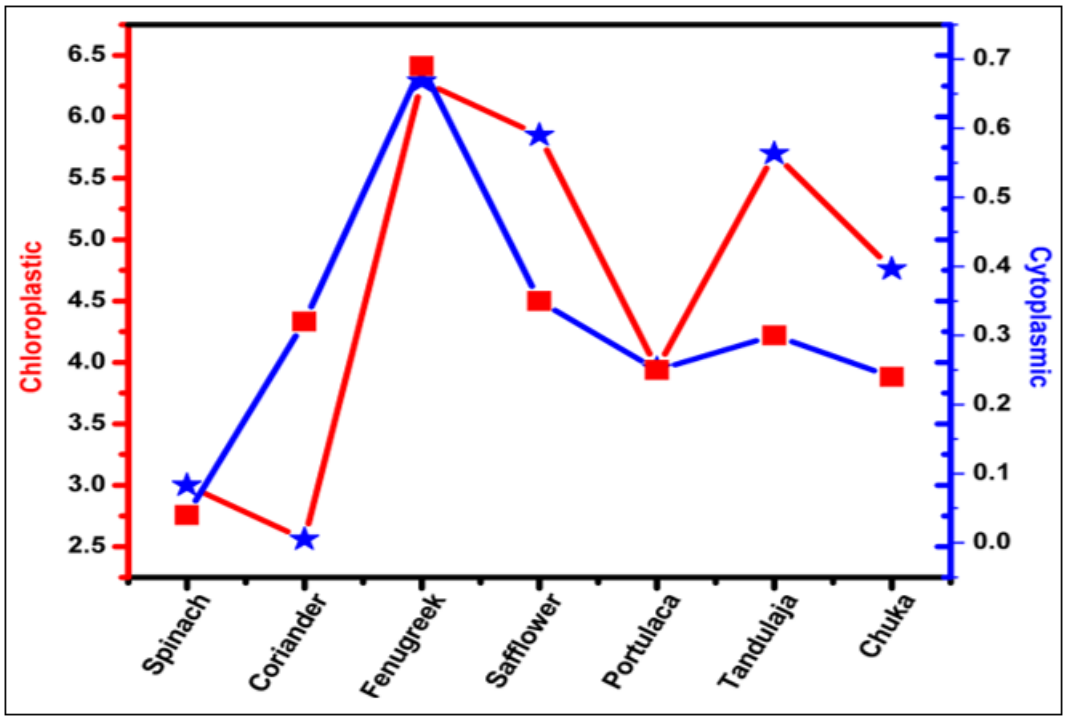

Figure 5: LPC proportion in seven vegetables distributed in chloroplastic and cytoplasmic protein

4. Conclusion

- Spinach, Rumex (chukka) and Portulaka yield more leaf juice (80 ml/100 gm) than other veggies.
- Coriander leaves recorded the highest PCR/100 gm (55) followed by Safflower (35).
- The protein contents in the leaves of fenugreek and spinach were much higher than other selected veggies.
- Coriander reported lowest protein yield.

Selection of suitable growth season, proper supplement of growth required factors, optimum harvest age, clean cutting (to avoid deterioration within a few hours) can enhance the protein yield. All seven types of vegetables used for fractionation are found suitable for GCF and are good source of cytoplasmic and chloroplastic proteins. Since these vegetables are easily available to people can facilitate a cheap source of proteins.

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