

Impact of storage on chemical composition of fenugreek (*Trigonella foenum-graecum*) leaf extract derived from green crop fractionation

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Abstract:

During present investigation, study was undertaken on leaf extracts of Fenugreek which were stored up to 33 hours at room temperature. The changes in the contents of dry matter (DM), Nitrogen (N) and water soluble reducing sugars (WSRS) in the juice, stored for various hours, and the samples of leaf protein concentrate (LPC) and deproteinised juice (DPJ) obtained from them was studied. The overall results gave an indication of proteolysis, as well as fermentation of sugars during storage of leaf juice affecting the quality and quantity of LPC.

Key words: Green crop fractionation (GCF), Leaf protein concentrate (LPC), Deproteinised Juice (DPJ), Fenugreek (*Trigonella foenum-graecum*)

Introduction:

Green crop fractionation (GCF) involves maceration of green foliage which is subsequently pressed for the release of leaf Juice. The leaf juice is later on heated at 95⁰ C to prepare leaf protein concentrate (LPC) for human, animal, poultry nutrition as a source of protein, minerals and vitamins. The portion left behind after isolation of LPC from heated juice is called as deproteinised juice (DPJ).

As soon as the foliage is macerated to a pulp, autolysis begins (Singh, 1962; Batra *et al.*, 1976). This involves breakdown of proteins and other nutrients in the plant leading to further deterioration. Therefore the delay between making the pulp and its pressing should be avoided to attain maximum recovery of proteins in the LPC (Pirie, 1978). Similarly, the leaf juice or extract obtained due to the pressing of the pulp is also very labile and its chemical composition changes rapidly (Nasi, 1983). Proteolytic activity and microbial growth deteriorate leaf juice due to fermentation resulting in decrease in true protein content (Cheeseman, 1977; Stewart and Houseman, 1977; Pirie, 1978).

During the present investigation, studies were undertaken on leaf extract of Fenugreek which was stored up to 33 h at room temperature. Fenugreek (*Trigonella foenum-graecum*) or locally known as *methi*, one of the oldest known spice crop, is a nutritious green leafy vegetable.

Materials and Methods:

The green foliage of fenugreek was harvested at preflowering stage and immediately brought into the laboratory. After washing the foliage with water, it was macerated to a pulp (Davys and Pirie, 1969). The resulting pulp was immediately pressed and the juice released due to the pressing was collected in suitable container. The juice samples were stored for 0, 3, 6, 9, 24, 27, 30 and 33 hours in conical flasks which were plugged with cotton. After storing the juice for specific time, a sample was dried in an oven at 95⁰ C till constant weight for determination of dry matter (DM). The dry leaf juice was employed for the determination of nitrogen (N) by microKjeldhal method (Bailey, 1967) and water soluble reducing sugars (WSRS) with folin-wu tubes (Oser, 1979). A sample of stored juice was employed for the preparation of leaf protein concentrate (LPC) by heat coagulation. For this purpose about 100 ml juice was added to 20 ml boiling water with constant stirring. It was heated up to 95⁰ C and filtered through whatman filter paper through 3-4 washings using distil water. The LPC was dried in an oven to record the yield of LPC-DM/100 ml juice. Similarly, the deproteinised juice (DPJ) was also dried in oven to determine the amount of DPJ-DM /100 ml of juice. The dry LPC and DPJ samples were used for the determination of N and WSRS contents as above.

The data obtained for DM, N and WSRS content in juice, LPC and DPJ samples; were statistically analyzed for standard deviation (S.D.), standard error (S. E.) and critical difference (C. D.) following Panes and Sukhatme (1978) and Mungikar (1997, 2003).

Results and Discussion:

Tables 1 & Fig. 1 give an account on changes associated with the storage of fenugreek leaf juice samples. Fenugreek is a protein rich and nutritious leafy vegetable. In case of fenugreek, the % DM of fresh juice was 6.96 which significantly decreased to 6.54 after 9 hours and to 6.28 % after 33 hours. The nitrogen content in DM of juice also decreased from 6.88 % in fresh juice to 4.98 % after 33 hours of storage. The gradual decrease was observed in WSRS content from 3.10 % at the starting to 1.59 % at the end of the experiment i.e. after 33 hours. (Table 3, Fig. 3). The fresh juice yielded 3.45 g LPC/100 ml, which significantly decreased to 2.71 g /100 ml, after 33 hours. The % N in LPC-DM decreased from 10.79 % to 9.37 %. A sharp decline was observed in case of WSRS content, from 0.37 to 0.03 %. The yield of DPJ-DM fluctuated within the range of 3.50 to 3.56 %. The N % in DPJ-DM significantly increased from 2.42 to 3.49. However, the WSRS content declined from 5.33 % to 3.09 %. Thus, storage of leaf juice resulted in its deterioration and ultimately affecting the yield of LPC per unit volume of and its nitrogen (N) content.

Conclusion:

With the storage of leaf juice samples from fenugreek, the dry matter (DM), nitrogen (N) in DM and water soluble reducing sugar (WSRS) decreased. The decrease in these contents affected the yield of LPC and DPJ dry matter (DM) as well as their nitrogen and sugar content. On an average, a decline in the yield of LPC-DM per unit volume of the juice was experienced with decreased nitrogen and sugar content in it. Thus, storage of the juice resulted in low recovery of nitrogen in the LPC coupled with its low yield.

It can be thus concluded that storage of the fenugreek leaf juice for more than 3 hours alter its chemical composition leading to low recovery of LPC of poor nutritive value, hence leaf juice should be immediately used for the preparation of LPC to make the process of GCF efficient. The results obtained are in accordance with the Madhekar (2025).

Table 1: Effect of storage on chemical composition of fenugreek juice obtained during green crop fractionation

Time of storage (hours)	Juice			Leaf Protein Concentrate (LPC)- Dry matter (DM)			Deproteinised Leaf Juice (DPJ)- Dry matter(DM)		
	% DM	% N	% WSRS	Yield / 100ml	% N	% WSRS	Yield / 100ml	% N	% WSRS
0	6.96	6.88	3.10	3.45	10.79	0.37	3.50	2.42	5.33
3	6.86	6.72	2.86	3.36	10.62	0.29	3.50	2.78	5.06
6	6.76	6.30	2.69	3.32	10.62	0.23	3.43	3.13	5.02
9	6.54	6.30	2.14	3.29	10.37	0.21	3.24	3.07	5.04
24	6.42	5.72	2.04	3.29	10.12	0.17	3.12	3.44	4.68
27	6.42	5.56	1.97	2.98	9.87	0.14	3.43	3.17	3.96
30	6.40	5.14	1.91	2.85	9.62	0.08	3.54	3.17	3.45
33	6.28	4.98	1.59	2.71	9.37	0.03	3.56	3.09	3.09
Mean	6.58	5.95	2.28	3.16	10.17	0.19	3.14	3.03	4.45
S. D.	0.24	0.71	0.53	0.06	0.53	0.10	0.10	0.30	0.84
S. E.	0.08	0.25	0.18	0.02	0.18	0.03	0.03	0.10	0.29
C.D. (p=0.05)	0.20	0.59	0.44	0.05	0.44	0.09	0.07	0.23	0.68

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