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LPC: A Good Source of Cyanocobalamine (B_{12}), Ascorbic Acid (Vitamin C) and Folic Acid (Vitamin B_9)

K.V.Badar[1*] and Sayyed Iliyas[2]

[1]Department of Botany, Yeshwantrao Chavan College, Sillod, Dist- Aurangabad (M.S.), India; [2]Department of Botany, AKI'S Poona College of arts, Science and commerce, Pune camp, Pune (M.S.), India

Abstract

LPC of twenty plants was prepared. Cyanocobalamine (B_{12}), ascorbic acid (vitamin C) and folic acid (vitamin B_9) was estimated from LPC. Higher yield of vitamin B_{12} (cynocobalamine) in wet LPC was recorded in *Bennicasa hispida, Coccina grandis* and *Vigna mungo*. The maximum yield of vitamin C (Ascorbic acid) and folic acid was recorded in *Vigna mungo*.

Key words: Vitamins, LPC, Ascorbic acid, Folic acid

Introduction

Vitamin B_{12} has its greatest effect on nucleic acid formation. The most characteristic sign of a deficiency of Vitamin B_{12} in man in the development of a macrocytic anemia or characteristic lesion of the nervous system (Combined system disease). Neurologic systems may supervane in B_{12} deficiency states without the prier development of anemia. Vitamin B_{12} involved in purine and pyrimidine metabolism synthesis of nucleic acid (DNA) mathration of red blood cells, methionine metabolism, and transmethylation contains cobalt, which is the only known function for this element Ritche (1968). The infant is usually well supplied with vitamin C at birth. However, infant 6-12 months of age who are fed processed milk formulas not supplemental with fruit and vegetable are very susceptible to the development of infantile scurvy. The best food sources of Vitamin C are citrus fruits, berries, melons, tomatoes, raw cabbage and leafy green vegetables. The tissues and body fluids contain varying amount of Vitamin C with the exception of muscle, the tissues of the highest metabolize activity (Witting , 1972). Sever ascorbic acid deficiency produces scurvy the pathologic signs of this deficiency are almost entirely confined to supporting tissue of mesonchymal origin (bone dentine, cartilage and connective tissue.) Vitamin C maintains normal intercellular material of cartilage, dentine and bone probably has specific role in collagen synthesis by activity on praline hydroxylation.

Association with oxidation reduction system of tissues metabolism of some amine acids e.g. tyrosine praline. According to some clinical nutritionists folic acid deficiency is possible the most common Vitamin deficiency in North America and Western Europe. This is especially true in pregnancy wherein folic acid deficient is said to be the most frequent cause of mesalublastic anemia. Folic acid deficiency should be considered in connection with alcoholism hemolytic anemia's tropical and nontropical sprue and the anemial occurring in infancy pregnancy or malignancies (Schwarz, 1954). Folates are present in a wide variety of plant tissue Manly as poly glutamates in reduced methyl or fermyl forms. The monoglatamale pleroylmonoglutamic acid chemically designated folic acid (folacin) is actually a minor component of the folates contained in the diet. The concept of competitive inhibition or metabolic antagonism reveals that, the antagonists to folic acid have found clinical application in the treatment of malignant disease, and confirmation of the action of folic acid in cell growth has been obtained in studies of the effect of these antagonists on cells maintained in tissue culture. Folic acid involved in transfer and utilization of the single carbon moiety, participates in synthesis of purines, thymine and methyl groups has specific role in metabolism of histidine and well demonstrated role in hematophoresis Silber and Moldow (1970).

The leaf extract or juice contains proteins, sugars, salts, lipids and vitamins along with the moisture in plant. When the juice is heated to over 80°C, or acidified to pH 4, green protein rich curd referred as leaf protein concentrate (LPC) is produced. The LPC can be separated from deproteinised juice (DPJ) – brown whey like liquid – by filtration through cotton cloth. In this way green foliage can be fractionated mechanically into three fractions: (i) fibrous pressed crop, (ii) leaf protein concentrate and (iii) deproteinised juice (Pirie, 1978).).

Considering the fact attempt has been made to prepared wet LPC, dry LPC and DPJ from different crop with and intension to develop a system for production of vitamins viz. vitamin C, folic acid and vitamin B_{12}.

Material and Methods

Foliages of twenty plants viz *Adhatoda vasica, Benincasa hispida, Brassica oleracea V. botrytis, Brassica oleracea V. Capitata, Cassia tora, Centella Asiatica, Coccinia grandis, Coriandrum sativum, Cucusmis sativus, Eclipta alba, Erythrina varegata, Medicago sativa, Moringa oleofera, Phaseolus valgaris, Raphanus sativus, Sesbania grandiflora, Solanum nigrum, Trigonella foenum graecum* and *Vigna mungo* were collected from either field or market were immediately brought into the laboratory for fractionation and washed with water to remove adhering dust and mud particles. 1 kg of leaves was taken for the preparation of juice. The foliage was mixed to a fine pulp using domestic grinder or mortar and pestle. Pulp was placed on cotton cloth and manually pressed to extract the leaf juice.

One hundred ml of juice was taken for preparation of leaf protein concentrate (LPC). For this purpose, 20 ml distilled water was boiled in a beaker. The juice was slowly added to the boiling water with constant stirring and heated to 90 ± 5°C. The heated juice was filtered through Whatman filter paper to isolate leaf protein concentrate (LPC) formed due to heating of juice. The LPC was dried in an oven till constant weight and the dry weight was recorded. The samples of WET, DRY LPC and DPJ were collected for analysis of thiamine, riboflavin and pyridoxine. Cyanocobalamine (B_{12}), ascorbic acid (vitamin C) and folic acid (vitamin B_9) was estimated by standard method (Jordan, 2000)

Results and Discussion

Table 1 show that, the amount of vitamin B_{12} (cynocobalamine) was on an average 1.25 ± 0.09 mcg/100g in wet LPC. Higher yield of vitamin B_{12} (cynocobalamine) in wet LPC was recorded in *Bennicasa hispida, Coccina grandis* and *Vigna mungo* (1.4 mcg/100 g). Lower amount of vitamin B_{12} was recorded in *Adhathoda vasica, Erythrina variagata* and *Phaseolus vulgaris* (1.1 mcg/ 100g). The yield of vitamin B_{12} (cynocobalamine) was on an average 0.95 ± 0.14 mcg/100g in dry LPC. The value for coefficient of variation (c.v.=0.08%) showed more variation in dry LPC as compared to that recorded for wet LPC. The higher yield of vitamin B_{12} (cynocobalamine) was recorded in *Vigna mungo* (1.3 mcg/100g).

The yield of vitamin C (Ascorbic acid) was on an average 30.6 ± 3.84 mg/100g in wet LPC. Higher yield of vitamin C in wet LPC was recoded in *Brassica oleoracea* v. *capitata* (35 mg/100 g). Lower yield of vitamin C was recorded in *Sesbania grandiflora* and *Solanum nigrum* (24 mg/ 100g). The yield of vitamin C (Ascorbic acid) was on an average 23.2 ± 4.26 mg/100 g in dry LPC. The maximum yield of vitamin C (Ascorbic acid) was recorded 32 mg/100 g in *Vigna mungo*

** Corresponding Author, Email: badarkakasaheb@yahoo.in*

and minimum 17 mg/100 g in *Cassia tora* and *Solanum nigrum.* The amount of vitamin C was not observed in DPJ. The value for coefficient variation (C.V. = 2.45%) showed more variation in dry LPC as compared to that recorded for wet LPC (Table 2).

Table 1. Amounts of cyanocobalamine (B_{12}) of wet LPC, dry LPC and DPJ of twenty plants

Sr.No.	Name of the Plant	Composition per 100 g		
		Wet LPC (mcg)	Dry LPC (mcg)	DPJ (mcg)
1.	*Adhatoda vesica*	1.1	0.56	-
2.	*Benincasa hispida*	1.4	0.95	-
3.	*Brassica oleracea V. botrytis*	1.3	0.96	-
4.	*Brassica oleracea V. capitata*	1.3	0.96	-
5.	*Cassia tora*	1.2	0.88	-
6.	*Centella asiatica*	1.2	0.99	-
7.	*Coccinia grandis*	1.4	0.95	-
8.	*Coriandrum sativum*	1.3	0.98	-
9.	*Cucurbita maxima*	1.2	0.81	-
10.	*Cucusmis sativus*	1.2	0.95	-
11.	*Eclipta alba*	1.3	0.96	-
12.	*Erythrina varegata*	1.1	0.92	-
13.	*Medicago sativa*	1.2	0.95	-
14.	*Moringa oleifera*	1.2	0.93	-
15.	*Phaseolus valgaris*	1.1	0.96	-
16.	*Raphanus sativus*	1.3	0.98	-
17.	*Sesbania grandiflora*	1.3	0.89	-
18.	*Solanum nigrum*	1.2	0.97	-
19.	*Trigonella foenum graecum*	1.3	1.2	-
20.	*Vigna mungo*	1.4	1.3	-
	Mean	1.25	0.95	
	S.D.	0.09	0.14	
	C.V.	0.05	0.08	

Table 2. Amounts of ascorbic acid (vitamin C) of wet LPC, dry LPC and DPJ of twenty plants

Sr.No.	Name of the Plant	Composition per 100 g		
		Wet LPC (mcg)	Dry LPC (mcg)	DPJ (mcg)
1.	*Adhatoda vesica*	32	18	-
2.	*Benincasa hispida*	32	26	-
3.	*Brassica oleracea V. botrytis*	33	25	-
4.	*Brassica oleracea V. capitata*	35	27	-
5.	*Cassia tora*	25	17	-
6.	*Centella asiatica*	32	25	-
7.	*Coccinia grandis*	32	24	-
8.	*Coriandrum sativum*	34	26	-
9.	*Cucurbita maxima*	33	23	-
10.	*Cucusmis sativus*	32	26	-
11.	*Eclipta alba*	26	19	-
12.	*Erythrina varegata*	28	20	-
13.	*Medicago sativa*	34	25	-
14.	*Moringa oleifera*	29	22	-
15.	*Phaseolus valgaris*	25	18	-
16.	*Raphanus sativus*	33	26	-
17.	*Sesbania grandiflora*	24	19	-
18.	*Solanum nigrum*	24	17	-
19.	*Trigonella foenum graecum*	34	29	-
20.	*Vigna mungo*	35	32	-
	Mean	30.6	23.2	
	S.D.	3.84	4.26	
	C.V.	2.21	2.45	

Table 3. Amounts of folic acid (vitamin B9) of wet LPC, dry LPC and DPJ of twenty plants

Sr.No.	Name of the Plant	Composition per 100g		
		Wet LPC (mcg)	Dry LPC (mcg)	DPJ (mcg)
1.	*Adhatoda vesica*	27	19	-
2.	*Benincasa hispida*	29	24	-
3.	*Brassica oleracea V. botrytis*	30	24	-
4.	*Brassica oleracea V. capitata*	29	24	-
5.	*Cassia tora*	23	15	-
6.	*Centella asiatica*	27	22	-
7.	*Coccinia grandis*	31	25	-
8.	*Coriandrum sativum*	30	25	-
9.	*Cucurbita maxima*	28	25	-
10.	*Cucusmis sativus*	31	25	-
11.	*Eclipta alba*	22	16	-
12.	*Erythrina varegata*	22	13	-
13.	*Medicago sativa*	29	22	-
14.	*Moringa oleifera*	23	16	-
15.	*Phaseolus valgaris*	25	20	-
16.	*Raphanus sativus*	28	23	-
17.	*Sesbania grandiflora*	24	19	-
18.	*Solanum nigrum*	24	21	-
19.	*Trigonella foenum graecum*	30	26	-
20.	*Vigna mungo*	36	32	-
	Mean	27.4	21.8	
	S.D.	3.66	4.53	
	C.V.	2.10	2.60	

Table 3 gives information that, the amount of vitamin B_9 (folic acid) was on an average 27.4 ± 4.53 mcg/100 g in wet LPC. The amount of vitamin B_9 (folic acid) was observed on an average 21.8 ± 4.53 mcg/100 g in dry LPC. The amount of vitamin B_9 (folic acid) was not observed in DPJ. The maximum yield of vitamin B_9 (folic acid), 36 mcg/100 g and 32 mcg/100g in *Vigna mungo* in wet LPC and dry LPC respectively. However, minimum yield of vitamin B_9 (folic acid) was recorded in *Eclipta alba* and *Erythrina variegata* (22 mcg/100 g) in wet LPC and *Ertythrina variegata* (13 mcg/100g) in dry LPC. The value for coefficient of variation (C.V. = 2.60%) showed more variation in dry LPC as compared to that recorded for wet LPC.

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