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STUDIES OF EXTRACTION OF LEAF PROTEIN (LP) FROM LOCAL VEGETATION FROM LEGUMES

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ABSTRACT: The process of Green Crop fractionation (GCF), extraction of Leaf protein (LP) and preparation of Leaf protein concentrate (LPC) has been recommended to make available a source of protein for animal and human nutrition in order to eradicate protein deficiency and malnutrition (Pirie, 1942). The process involved maceration of fresh green leaves followed by pressing. The leaf juice released due to the pressing is then either heated or acidified, as a result of which the proteins in juice coagulate to a curd referred to as leaf protein concentrate (LPC) leaving behind deproteinized juice (DPJ). The LPC is protein-mineral-vitamin concentrate suitable for human nutrition as well as animal feeding.

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1.INTRODUCTION

It has been firmly established that with GCF, the efficiency of using proteins available in plants increases by making available ample amount of nutritionally superior and cheap source of protein. Selection of suitable plant species for the preparation of nutritionally superior protein concentrate in adequate quantity as the first step of investigation pertaining to this concept. Although protein occurs in all plant, its extractability varies form plant to plant and even at different growth stages of a given plant. Several factors affect extractability of protein from green leaves which includes moisture, fibre , and nitrogen content of the leaves; pH of the biological material and nature of the constituents present in the leaves. Studies at various place have shown a need of screening local vegetation of the region on the basis of distribution of dry matter and nitrogen in the various fractionation products, their extractability in juice and incorporation into LPC. On the basis of this

the plants are either recommended or not for the preparation of LPC. Marathwads region of Maharashtra state has a rich vegetation comprising of various types of plants growing throughout the year. During present investigation attempts have been made to evaluate potential of 100 plants, readily and commonly available in this region, for the preparation of LPC with an objective to recommend species suitable for leaf protein extraction.

2. MATERIAL AND METHODS

Fresh green foliages of 100 plants species growing in and around University campus were collected and immediately brought into the laboratory. The 100 plants selected were either weeds, wild plants, ornamental plants, horticulture or crop plants. As far as possible , the leaves were collected from these plants under vegetative phase of growth. The habit of the plants include, annuals, perennials, creepers, climbers, trees, herbs and shrubs. While selecting the plants , species having some other botanical value were considered. The fresh leaves were washed with water, strained and macerated to a pulp (Davys., et al., 1969). The resulting pulp was then pressed by keeping it on cotton cloth (Davys., et al.,1969). The juice released due to the pressing of pulp was collected in a suitable container and its volume was measured. The amount of pressed crop residue, left after extraction of juice, was weighted and its weight was recorded. A sample of 100 ml juice was taken for the preparation of leaf protein concentrate (LPC) by heat coagulation method (Pirie, 1971). For this purpose about 20 ml water was boiled in a beaker and to it the leaf juice was slowly added with stirring till the temperature reached to 95. The heated juice was then filtered through previously weighted Whatman filter paper. After giving a final wash with hot water, the filtrate called as deproteinized juice (DPJ) was collected in a suitable container. The samples of pulped fresh foliage, pressed crop residue (PCR), leaf juice, leaf protein concentrate (LPC) and deproteinised juice (DPJ) were dried in electric oven at 90 5 till constant weight and dry weight was recorded. The dried samples wee ground to a fine powder and employed for the estimation of nitrogen (N). The nitrogen content was determined in duplicate by microKjeldahl method, which involved digestion with sulphuric acid H_2SO_4 in presence of catalyst and titration of the ammonia liberated during distillation (Bailey, 1967). Taking into consideration, the dry matter (DM) and nitrogen (N) content in the dry matter (DM) obtained per unit weight of foliage, the amount of dry matter and nitrogen distributed in various fractionation products were determined. The relative distribution of dry matter and nitrogen in each fraction was then calculated. The data obtained for dry matter and nitrogen content and their distribution in various fractionation products was statistically analysis for mean, standard deviation and coefficient of variation (c.v.) following Panse and Sukhatme (1978) and Mungikar (1997, 2003).

3. RESULTS AND DISCUSSION

Out of 100 plants taken for investigation forty plants were from family leguminosae. Among the remaining plants, most of the plants were from family bignoniaceae, Acanthaceae, Amaranthaceae, Apocynaceae and Asteraceae, Lythraceae etc. While undertaking fractionation, it was observed that the texture of each foliage varied considerably, as a result of which some of the plants yielded considerable amount of juice. A small amount of water was required by the foliages of some plants while macerating, while in some plants the extraction of juice from the foliages was difficult due to mucilaginous nature or otherwise dryness. The foliages of peltophorum pterocarpum, Cassia siamea, Cassia roxburghii, Parkia bigladulosa etc. were mucilaginous, yielding minimum juice. The leaves of Albizia amara, Baunia variegate, Kigelia pinnata, Thevetia peruviana etc. resulted in the juice with foam. While the leaves of Dalbergia sisso, Annona squamosa, Malvastrum coromandelianum etc. plants yielded small amount of thick juice. The experience of fractionating foliages of 100 plants revealed that all of the plants were not equally suitable for mechanical fractionation as extraction of the juice was not easy. Table 1 gives an account on per cent dry matter (DM) and nitrogen (N) percentage of dry matter in fresh foliage, pressed crop, juice, leaf protein concentrate and deproteinzied juice. The per cent dry matter of green foliage widely fluctuated between 4.6 to 48.4% with an average value of 25.0 10.5 %. The variation in dry matter was to the extent of 42% on the basis of coefficient of variation (c.v.) which may be due to the variation among the species, growth stage of plant, time of harvesting and nature of leaves. It was, however, observed that the dry matter content in the plants which were cultivated either in horticultural or agricultural land was moderate. The moisture content in tree leaves was less with higher values for DM content. The N% of dry matter in leaves of the plants under investigation also fluctuated widely from (1.1 to 6.0%); on an average the leaves were with, 3.19 to 1.11% nitrogen in the dry matter. A careful observation of the results indicate that in general the leaves form leguminous plants and those growing under favorable conditions were with high nitrogen content. On an average the pressed crop residue (PCR) had 28.6 7.1 % DM with the value of 24.7 % for coefficient of variance (c.v). The per cent DM in PCR ranged form 12.0 to 49.5%. In comparison to the fresh foliage the value of c.v. for PCR was 24.7 % showing comparatively less variation the DM content. This was due to the removal of excess moisture form the plants. The values for nitrogen per cent of dry matter in pressed crop were between 0.66 to 4.91 with an average value 2.62 0.90%. The values for N% of DM in PCR followed the same trend as was found in fresh crop with 4.5% coefficient of variation. In comparison on to fresh and pressed foliage the per cent dry matter in the juice was too low due to the presence of moisture extracted from the foliage during pressing of the crop. The Juice can thus be considered as a high moisture product, the DM of which fluctuated between 1.7 to 12.0%. On an average the leaf juice 5.88 ≠ 2.43 % DM with a wide variation (c.v. = 41.29). the juice was found to be rich in N content; the per cent N in the DM of juice ranged between 1.16 to 10.0% .The nitrogen (N) content

in leaf protein concentrate (LPC) was highest with an average value of 7.00 ≠ 2.17. The value fluctuated form 1.6 to 11.4% of DM depending on the amount and nature of juice extracted from fresh foliage. The last fractionation, deproteinized juice (DPJ), which is considered as a by product of GCF system, was with minimum dry matter content ranging from 1.2 to 10.9%. In general, per cent DM content in DPJ was 3.78 ≠ 2.08% with a wide variation among the values (c.v = 55.0). The nitrogen content in DPJ also fluctuated widely and it ranged from 0.41 to 7.00% with an average value of 1.95 ≠ 1.41% having a coefficient of variation (c.v) of 72.3%. The over all results presented in table 1 indicate that there was a wide variation among the species when DM and N content of DM were considered. However the plants gave pressed crop residues with minimum variation in DM content, or otherwise the variation in both the component increased in remaining fractionation products. The results indicate that each plant has different chemical composition and morphological nature when it is considered for fractionation. The distribution of dry matter (DM) in various fractionation products along with their relative distribution is presented in the table 2. One kg of fresh foliage contained from 46 to 484 g DM with an average value of 246 ≠ 106 g. On an average, out of total DM in fresh foliage 75% retained in the pressed crop residue while 25% was extracted in the juice. Thus in general the dry matter extraction ratio (DMER) can be considered as 25.8%. However, in many plants it was as high as 90% while as low as 24.8%. Thus wide fluctuation (c.v. = 54.73) was experienced in the DMER. In general the PCR obtained from 1 kg green foliage had 185 ≠ 101 g dry matter. As observed with the PCR the dry matter content in the juice extracted from 1 kg foliage was also fluctuated widely from 30.5 to 150.0 g. In general leaf juice extracted from 1 kg of foliage was with 66.0 ≠ 25.8 g dry matter. Table 2 gives the values for the amount of LPC dry matter obtained during fractionation of 1 kg green foliage. The amount of LPC obtained was lowest (8.20 g) in Rumex vesicarius while maximum in Cicer arietinum (126.0 g). It appears that the yield of LPC per kg green foliage largely depends upon extractability of juice from the leaves. It is also true that the nitrogen content in the foliage also play an important role in deciding the yield of LPC dry matter per kg of green foliage. On an average the yield of LPC dry matter per kg of green foliage. On an average the yield of LPC – DM per kg of foliage was 34.8 ≠ 22.1 gm with a very wide variation (c.v. = 63.5%). The values presented in table 2 for the LPC – DM and that of c.v. indicate that the plants behave differently as far as their fractionation for leaf protein is concerned. Therefore, there is need for selection of the species which could yield reasonable amount of LPC – DM per kg of green foliage. Singh (1969) is of opinion that a plant material should be recommended for fractionation if the yield of dry LPC is more than 10 g per kg. If this is taken into consideration almost all plants except Tamarindus indica L. Calotropis procera R. Br., Carrisa congesta Wt. Rumes vesicarius L. etc. were suitable for the preparation of LPC. He is also of the opinion that the LPC-DM should contain more than 5% nitrogen on DM basis. If this criteria of N% of dry matter in LPC is taken into consideration, only 75 plants out of 100 can be

recommended for the preparation of LPC as the remaining 25 plants produced LPC with less than 5 % N on dry matter basis. Among all the plants studied the LPC samples prepared from Alysicarpus tetragonolobus Edgew., Bauhinia variegate L., Erythirina suberosa Roxb., Erythrina variegate L., Parkia bigladulosa Wt, & Am., Peltophorum ptercoarpum (DC) Baker, Anethum graveolens L. and Spinacia oleracea L. resulted in LPC with more than 65% protein. The overall results indicate that there is a large potential for preparation of LPC from locally available vegetation, as 75 plants out of 100 screened during present investigation gave encouraging results. Table 3 gives an information on the distribution of nitrogen (N) in various fractionation products. On an average the green foliage had 7440 mg nitrogen (N) per kg, out of which 2810 mg (37.7%) got extracted in the juice while 4620 mg (62.1%) remained unextracted in the PCR. Thus per cent nitrogen(N) extractability can be cosidered as 37.7%. Out of this 30.7% nitrogen(N) got incorporated into LPC indicating that the extractability of protein nitrogen was 37.7%. Figs. 1 and 2 illustrates the distribution of DM and N respectively in various fractionation products like PCR, juice, LPC and DPJ. The frequency distribution was not normal, however, it had a positive skew. Most of the plants were thus with lower values for DM and N content. As with dry matter (DM) there was large variation in the content of nitrogen in various fractionation products which ranged from 42.4% in fresh crop to 82.4% in deproteinized juice. In conclusion it can be stated that the extractability of nitrogen (N) fluctuated widely mainly due to the morphological nature of the foliage, its texture as well as its moisture content and chemical composition.

4. CONCLUSION

India is bestowed with a bounty of nature having large cafeteria of plants. The country is famous among the continent for biodiversity of plants. Various types of plants in general, and flowering plants in particular are distributed in different parts of India. These include twinners, crippers, climbers, herbs, shrubs, trees, epiphytes, hydrophytes, xerophytes etc. In addition various plants have their own habitat as well as season for vegetative and reproductive growth. In Marathwada region till now 1645 species and 746 genera have been recorded belonging to 155 families of flowering plants (Naik, 1984). In order to overcome protein deficiency and malnutrition, the extraction of proteins directly from the leaves in the form of LPC has been recommended by Pirie in the year 1942. Since then the research workers are in search of suitable species for leaf protein extraction. While selecting the species its availability and nature of the foliage in relation to extractability of DM and N is taken into consideration. During present investigation attempts were made to exploit 100 plants growing in and around University campus for the preparation of LPC and to study the distribution DM and N in various fractionation products. While undertaking the experiment, it was experienced that several species are readily and abundantly available throughout the year while other are scanty and their availability is restricted to a particular season. It was also experienced that the texture of the foliage play an important role during fractionation as the leaves of many plants contain mucilage and other

chemical compounds which create difficulties in extraction of juice. This leads to low extractability of DM as well as N resulting in poor yields of LPC with limited protein content. The results obtained and presented in tables 1, 2 and 3 and figures 1 and 2 indicate that there is a large poteintial to exploit vegetation available in the region for leaf protein (LP) extraction. Out of 100 species screened, 75 species were found suitable for leaf protein extraction. Furthermore out of total DM and N available in 1 kg of foliage 14.1% DM and 30.7% N can be utilized through the LPC. It was further observed that about 12% DM and 7.0% N from fresh crop is released in by-product DPJ, which has to be used efficiently. The pressed crop fresh crop is residue contain on an average 12 to 16% crude protein which can be used in animal nutrition, however further detail investigation on each species are necessary to exploit them for GCF and LPC production. Their availability, yield, quality of LPC, nutritive value and presence anti-nutritional factors should be thoroughly investigated before recommending a plant for fractionation and preparation of LPC for human / animal consumption.

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SUPPLEMENTARY FILES

Table 1 : Percent dry matter (DM) and Nitrogen (N)% of DM in various fractionation products (Contd.)

Sr. No.	Plants	Fresh Crop		Pressed Crop		Leaf Juice		Leaf Protien Concentrate	Deproteinized Juice	
		DM	N	DM	N	DM	N	N	DM	N
1	*Acacia chundra (Roxb. ex Rottl.) willd*	44.00	3.33	32.50	3.41	9.50	2.66	4.08	6.00	0.83
2	*Acacia leucophloea (Roxb) wild*	48.40	2.66	34.00	2.75	6.60	1.91	3.08	6.60	0.50
3	*Acacia nilotic (L.) Del sub. Sps. Indica*	39.00	2.83	40.00	3.08	10.80	1.91	3.16	6.90	0.58
4	*Acacia pennata (L.) Willd.*	34.80	3.16	23.60	3.33	1.90	2.58	3.41	3.30	0.66
5	*Albizia amara (Roxb.) Bovin*	46.00	2.91	33.40	3.33	7.40	1.91	3.75	5.00	0.58
6	*Alysicarpus tetragonolobus Edgew.*	23.30	4.91	27.20	2.08	4.70	10.00	13.75	1.90	0.50
7	*Arachis hypogaea L.*	21.20	3.00	26.50	2.75	7.10	3.75	5.41	4.50	1.33
8	*Bauhinia variegate L.*	33.00	3.41	24.90	2.25	8.90	6.25	10.16	5.30	2.41
9	*Caesalpinia pulcherrima (L.) swartz*	31.50	2.58	32.00	2.50	5.00	3.00	6.25	3.80	0.83
10	*Canjus cajan (L.) mill.*	38.00	3.00	36.80	3.00	8.80	2.91	5.83	6.90	0.83
11	*Cassia auriculata L.*	39.10	2.66	37.50	2.16	3.90	5.83	7.16	2.60	2.16

12	*Cassia australis L.*	26.50	5.58	38.10	5.08	6.20	7.08	9.00	1.70	1.66
13	*Cassia fistula L.*	37.50	3.00	33.50	2.91	8.70	3.33	5.58	4.39	0.50
14	*Cassia roxburghii DC.*	42.50	2.25	37.80	2.16	10.40	2.91	5.16	6.41	0.58
15	*Cassia siamea Lamk*	36.50	2.66	31.10	2.00	10.60	4.83	6.08	6.20	2.25
16	*Cassia tor L.*	26.00	1.66	30.32	2.50	6.01	3.75	4.41	1.98	1.25
17	*Cicer arientinum L.*	32.10	3.00	30.00	2.58	10.30	3.50	3.83	4.70	1.00
18	*Crotalaria notonii wt & Arm.*	17.10	6.00	17.00	5.00	6.10	6.83	9.16	2.10	2.33
19	*Dalbergia sissoo Roxb.ex. DC.*	38.20	3.25	19.00	2.66	10.20	4.33	6.25	7.70	3.10
20	*Delonix regia (Bojer) Raf.*	30.50	3.75	22.90	3.58	8.50	4.16	6.00	4.80	1.50
21	*Desmodium gangeticum (L.)DC.*	30.70	2.66	41.00	1.66	4.00	5.66	6.08	2.60	2.91
22	*Lablab purpurea (L.) Sweet*	28.10	3.00	26.50	1.91	9.70	5.00	8.66	6.90	1.50
23	*Erythrina suberosa Roxb.*	15.80	4.50	20.90	2.91	4.90	9.33	11.41	1.70	2.66
24	*Erythrina variegate L.*	21.90	3.75	31.00	2.58	3.80	8.25	10.83	1.60	2.50
25	*Gliricidia sepium (Jacq.) Kunth*	25.00	3.33	32.50	3.33	4.90	3.33	4.50	2.20	1.33
26	*Goniogyna binata Roxb.*	20.00	3.75	26.70	3.33	4.40	5.25	8.83	3.10	2.08

27	*Hardwidwidckia binata Roxb.*	37.60	2.08	32.00	1.91	6.00	2.75	7.66	4.40	0.40
28	*Indigofera cordifolia Heyne ex. Roth*	15.70	2.75	57.90	2.16	5.80	5.25	6.58	1.50	1.41
29	*Indigofera duthiei Drum. Ex. Naik*	19.80	3.66	28.00	3.33	2.34	5.50	9.33	1.20	1.66
30	*Millettia ovalifolia L.*	36.80	2.91	26.20	2.83	5.20	3.75	4.66	2.50	1.41
31	*Parkia bigladulosa wt & Arm.*	40.00	2.83	38.10	2.50	4.20	6.41	10.83	2.80	3.08
32	*Peltophorum pterocarpum (DC.) Baker*	39.00	2.25	38.10	1.50	5.00	8.83	11.41	2.20	2.66
33	*Phaseolus radiates L.*	18.00	3.16	27.00	2.75	5.40	4.16	6.75	3.60	1.66
34	*Phaseolus radiates L. var. Kopergaon*	19.20	3.33	26.20	2.91	5.50	4.16	6.25	3.10	2.00
35	*Pongamia pinnata (L.) Pierr.*	39.10	4.25	35.70	3.83	8.50	6.41	7.83	3.70	3.25
36	*Prosopis juliflora (SW.) DC.*	40.00	2.91	32.30	1.75	11.50	6.58	7.16	4.50	1.25
37	*Tamarindus indica L.*	28.50	2.75	30.50	2.66	3.00	3.58	5.50	2.10	2.50
38	*Tephrosia hamiltonii Drum*	30.30	3.83	27.50	2.91	12.00	5.41	6.33	3.10	2.08
39	*Trigonella foenum-gracum L.*	10.40	.91	26.00	3.75	5.20	7.66	1.66	2.60	3.08

40	*Vigna unguiculata (L.) walp.*	17.41	3.50	28.10	2.25	6.10	5.41	7.25	2.80	5.00
41	*Acalypha indica L.*	23.70	4.25	31.00	3.16	7.10	6.50	9.00	3.60	3.33
42	*Achyranthes aspera L.*	18.80	3.33	26.50	2.50	4.30	5.16	5.08	2.80	5.00
43	*Adhatoda zeylanica Medic A. vasica Ness.*	24.30	3.33	27.00	2.66	7.10	5.25	7.66	4.90	2.66
44	*Ageratum conyzoides L.*	13.50	3.33	24.40	2.41	4.40	4.58	6.83	1.90	1.16
45	*Allamanda cathartica L*	18.20	3.16	22.00	3.41	5.70	2.50	5.00	3.70	0.91
46	*Alstonia macrophylla wall. Ex. G.Don*	27.00	1.91	27.40	1.75	7.80	2.25	4.66	5.00	0.50
47	*Alstonia scholaris (L.) R.Br.*	33.00	1.66	31.50	1.16	9.80	3.08	5.16	5.10	0.66
48	*Alternanthera sessilis (L.) R.Br.*	13.50	2.91	20.50	1.41	4.10	5.25	7.00	2.90	2.91
49	*Amaranthus hybridus L.*	15.40	4.91	20.00	2.66	6.20	7.41	8.33	2.10	4.41
50	*Amaranthus viridis L.*	19.30	2.16	27.10	0.66	5.50	3.75	4.75	2.30	1.50
51	*Amphilophium molle cham.et.schlecht.*	27.70	5.16	27.00	4.91	5.40	5.91	6.66	2.60	5.08
52	*Anethum graveolens L.*	11.00	4.75	23.50	2.08	5.90	6.83	11.00	4.40	4.08
53	*Annona squamosa L.*	29.00	3.00	17.50	2.33	5.60	4.00	4.75	10.90	1.00

54	*Azadirachta indica A. Juss.*	29.50	3.00	30.00	2.66	7.70	3.83	5.83	4.60	1.58
55	*Barleria cristata L.*	25.00	2.08	32.00	1.83	5.40	2.66	3.50	2.80	1.50
56	*Barleria prionitis L.*	26.00	2.41	32.00	2.00	5.70	3.50	7.33	4.60	1.75
57	*Callistemon rigidus R.Br.*	54.00	1.08	38.70	1.00	7.40	2.16	3.16	4.90	0.50
58	*Calotropis procera R.Br*	12.90	2.16	22.50	1.08	4.20	3.50	10.00	3.70	2.33
59	*Canna indica L.*	15.00	2.00	49.50	1.50	4.00	3.16	5.33	6.40	1.75
60	*Carissa congesta Wt.*	31.20	2.16	29.00	2.00	3.30	3.33	7.50	2.60	1.91
61	*Carthamus tinctorius L.*	8.00	4.66	19.70	2.75	4.20	5.83	9.33	2.70	3.83
62	*Clerodendrum inerme (L.) Gaerth.*	17.00	2.91	24.00	2.50	4.50	3.66	8.33	2.90	0.91
63	*Clerodendrum splendens G. Don*	25.00	3.00	27.00	2.83	4.90	3.91	6.66	3.90	1.33
64	*Crinum asiaticum L*	9.90	2.66	24.20	1.25	2.70	4.75	7.16	1.40	2.33
65	*Cynodon dactylon (L.)Pers.*	27.00	3.33	29.00	2.75	6.90	5.50	9.58	5.30	6.66
66	*Cyperus rotundus L.*	14.90	2.91	24.90	3.08	3.42	2.33	4.58	2.60	0.91
67	*Datura inoxia Mill.*	10.40	5.08	22.30	2.50	4.10	6.83	8.50	1.50	3.08
68	*Digitaria longiflora (Retz.) pers.*	17.20	2.25	27.00	1.75	2.50	4.83	7.91	1.50	2.83
69	*Doxantha*	39.0	2.00	41.9	1.83	9.90	2.66	4.16	7.80	2.16

	unguis-cati (L.) Miers.	0		0						
70	*Duranta plumier Jacq.*	22.10	2.33	28.00	2.41	5.90	2.00	5.33	5.00	0.75
71	*Erigeron sublyratus DC.*	11.10	3.33	25.70	3.25	2.50	3.25	5.83	1.40	0.83
72	*Ipomoea cairica (L.) Sweet*	12.80	2.50	12.00	1.75	4.40	3.16	5.66	2.60	0.50
73	*Ipomoea campanulata L.Var.Illustric. Clarke*	10.00	4.66	13.00	4.00	3.20	5.66	6.50	1.50	2.33
74	*Jasminum calophyllum Wall. Ex. Clarke*	29.60	2.58	31.00	3.16	7.20	1.50	4.00	7.80	0.40
75	*Jasminum mexynyi Hance.*	32.00	2.00	33.50	1.83	10.40	2.16	5.33	6.90	0.40
76	*Kigelia pinnata (Jacq) DC.*	35.00	1.83	28.00	1.66	4.40	3.41	5.91	2.80	1.25
77	*Lantana camara L.*	27.20	3.00	34.00	3.00	4.80	2.83	4.66	4.00	1.25
78	*Launaea procumbens (Roxb.)Ramayya & Raj.*	6.60	4.50	15.50	3.00	2.20	6.08	9.50	0.90	1.25
79	*Malvastrum coromadelianum (L.) Garcke*	19.20	4.00	17.00	3.50	3.40	6.66	9.16	1.80	3.83
80	*Menthe spicata L.*	15.80	4.08	28.20	3.50	3.80	5.25	5.83	1.30	3.66
81	*Moringa oleifera Lamk.*	22.00	4.41	25.30	4.75	7.30	3.83	6.25	4.70	2.08
82	*Murraya*	36.0	2.33	28.5	2.08	10.6	3.00	4.66	7.70	2.25

	koenigii (L.) Spreng.	0		0		0				
83	*Ocimum tenuiflorum L.*	19.00	2.66	25.10	2.08	4.50	3.33	4.16	1.70	0.91
84	*Pachypetra hymenaea (DC.) Gentry.*	38.70	3.50	29.00	2.66	7.70	6.25	6.91	3.10	4.58
85	*Parthenium hysterophors L.*	14.00	3.83	26.10	2.91	4.50	5.08	5.83	3.00	3.25
86	*Peristrophe paniculata (forssk.) Brummit*	20.00	4.75	38.30	2.91	6.10	7.66	8.91	2.70	5.41
87	*Polyalthia longifolia (sonner) Thw.*	42.90	2.00	35.00	2.00	5.60	1.83	3.41	4.60	0.83
88	*Pyrostegia venusta (Ker-Gawl) Miers.*	20.00	2.83	31.80	2.16	4.50	4.50	8.33	4.00	3.66
89	*Rumex vesicarius L.*	4.60	5.16	24.80	5.58	1.70	4.58	7.08	1.20	3.00
90	*Setaria verticillaa (L.) P. Beauv.*	13.00	3.66	25.50	2.33	2.90	6.50	9.91	2.00	3.83
91	*Solanum nigrum L.*	11.20	3.66	21.00	1.83	3.70	5.25	8.50	1.80	1.41
92	*Spathodea campanulata p. Beauv.*	31.00	1.66	28.50	1.83	9.50	1.16	2.08	7.80	0.40
93	*Spilanthes paniculata Wall.ex.DC.*	26.40	3.75	30.00	3.00	3.70	7.25	7.75	3.00	7.00
94	*Spinacia oleracea L.*	8.00	5.66	26.20	4.25	3.60	6.83	10.50	1.70	2.50
95	*Stereospermum*	30.2	1.75	29.1	1.41	6.20	3.50	5.00	3.00	0.83

	suaveolens (Roxb.) DC.	0		0						
96	*Tagetes patula L.*	13.00	3.33	23.40	1.66	4.70	4.75	8.33	2.70	0.83
97	*Tecoma stans (L.) H.B.K. Nov.*	24.00	2.00	27.00	1.75	6.30	2.41	4.50	4.00	0.50
98	*Thevetia peruviana (pers.) K. Schum*	22.70	2.50	30.50	1.75	7.40	3.66	7.08	4.40	0.83
99	*Tridax procumbens L.*	13.00	3.41	26.50	3.58	3.10	3.00	8.33	2.24	0.75
100	*Wedelia chinensis (Roxb). Mill*	15.20	1.91	24.50	1.08	4.50	3.33	3.50	2.70	2.50
	Mean = S.D = C.V. =	25.00 10.51 42.05	3.19 1.11 34.79	28.65 7.09 24.76	2.62 0.90 34.35	5.88 2.43 41.29	4.50 1.87 41.55	7.00 2.17 31.00	3.78 2.08 55.00	1.95 1.41 72.30

Table 2 : Distribution of Dry matter (g) during fractionation of 1 kg green foliage

Sr. No.	Plants	Fresh Crop	Pressed Crop	Leaf Juice	Leaf Protien Concentrate	Deproteinized Juice
1	*Acacia chundra (Roxb. ex Rottl.) willd*	440.00 (100)	390.00 (88.63)	50.00 (11.30)	28.00 (06.40)	22.00 (04.90)
2	*Acacia leucophloea (Roxb) wild*	484.00 (100)	428.00 (88.51)	55.60 (11.48)	30.60 (06.31)	25.00 (05.17)
3	*Acacia nilotic (L.) Del sub. Sps. Indica*	390.40 (100)	304.00 (77.86)	86.40 (22.13)	45.10 (11.55)	41.30 (10.57)
4	*Acacia pennata (L.) Willd.*	347.70 (100)	263.20 (75.70)	84.50 (24.29)	58.70 (16.88)	25.80 (07.40)
5	*Albizia amara (Roxb.) Bovin*	460.00 (100)	330.10 (71.76)	129.90 (28.23)	54.80 (11.92)	75.00 (16.31)
6	*Alysicarpus tetragonolobus Edgew.*	233.00 (100)	150.00 (64.36)	83.04 (35.63)	59.60 (25.56)	23.50 (10.07)
7	*Arachis hypogaea L.*	212.00 (100)	158.80 (74.88)	53.20 (25.09)	31.60 (14.92)	21.60 (10.16)
8	*Bauhinia variegate L.*	330.40 (100)	234.50 (70.95)	96.60 (29.04)	47.60 (14.39)	48.40 (14.64)
9	*Caesalpinia pulcherrima (L.) swartz*	315.30 (100)	268.80 (85.25)	46.50 ()14.74	18.60 (05.91)	27.80 (08.83)
10	*Canjus cajan (L.) mill.*	380.40 (100)	294.00 (77.27)	86.40 (22.72)	35.60 (09.36)	50.80 (13.35)
11	*Cassia auriculata L.*	399.12 (100)	345.00 (86.44)	54.12 (13.55)	39.60 (09.92)	14.52 (03.63)
12	*Cassia australis L.*	265.20 (100)	198.00 (74.66)	67.20 (25.33)	49.60 (18.71)	17.56 (06.62)
13	*Cassia fistula L.*	374.40 (100)	304.60 (81.37)	69.70 (18.62)	38.80 (10.36)	30.90 (08.25)
14	*Cassia roxburghii DC.*	425.00 (100)	370.70 (87.22)	54.30 (12.77)	27.60 (06.49)	26.70 (06.27)
15	*Cassia siamea Lamk*	364.50 (100)	280.00 (76.80)	84.60 (23.19)	57.20 (15.68)	27.40 (07.51)
16	*Cassia tor L.*	260.00	173.40	86.52	67.96 (26.13)	18.56

		(100)	(66.72)	(33.27)		(07.13)
17	*Cicer arientinum L.*	320.60 (100)	178.20 (55.57)	142.44 (44.42)	126.20 (39.37)	16.20 (05.05)
18	*Crotalaria notonii wt & Arm.*	171.44 (100)	76.84 (44.82)	94.60 (55.17)	62.24 (36.30)	32.32 (15.85)
19	*Dalbergia sissoo Roxb.ex. DC.*	382.40 (100)	247.00 (64.59)	135.40 (35.40)	71.80 (18.76)	63.60 (16.63)
20	*Delonix regia (Bojer) Raf.*	305.40 (100)	220.00 (72.04)	85.40 (27.95)	50.50 (16.54)	34.84 (11.40)
21	*Desmodium gangeticum (L.)DC.*	391.20 (100)	328.10 (83.86)	63.10 (16.13)	43.70 (11.17)	19.40 (04.95)
22	*Lablab purpurea (L.) Sweet*	306.76 (100)	229.60 (74.84)	77.16 (25.15)	66.92 (21.89)	10.24 (03.33)
23	*Erythrina suberosa Roxb.*	281.20 (100)	182.70 (64.96)	98.50 (35.03)	48.20 (17.13)	50.40 (17.90)
24	*Erythrina variegate L.*	157.50 (100)	118.50 (75.24)	39.00 (24.75)	29.80 (18.89)	9.63 (05.86)
25	*Gliricidia sepium (Jacq.) Kunth*	218.70 (100)	173.60 (79.40)	45.10 (20.60)	31.20 (14.24)	14.00 (06.38)
26	*Goniogyna binata Roxb.*	250.00 (100)	201.56 (80.62)	48.44 (19.37)	30.48 (12.19)	17.92 (07.16)
27	*Hardwidwidckia binata Roxb.*	200.00 (100)	155.80 (77.88)	44.20 (22.12)	20.80 (10.38)	23.50 (11.74)
28	*Indigofera cordifolia Heyne ex. Roth*	376.20 (100)	297.00 (78.93)	79.20 (21.06)	25.60 (06.80)	53.60 (24.25)
29	*Indigofera duthiei Drum. Ex. Naik*	274.12 (100)	220.00 (8.25)	54.12 (19.74)	40.52 (14.78)	13.60 (04.96)
30	*Millettia ovalifolia L.*	198.00 (100)	168.00 (84.84)	30.00 (15.15)	15.00 (07.59)	15.00 (07.55)
31	*Parkia bigladulosa wt & Arm.*	367.70 (100)	335.30 (91.20)	32.30 (08.79)	23.20 (06.31)	9.10 (02.48)
32	*Peltophorum pterocarpum (DC.) Baker*	399.80 (100)	366.00 (91.55)	33.80 (08.44)	14.50 (03.63)	19.20 (04.81)
33	*Phaseolus radiates L.*	390.00	350.20	39.80	28.00 (07.18)	11.90

		(100)	(89.80)	(10.19)		(03.01)
34	*Phaseolus radiates L. var. Kopergaon*	180.00 (100)	125.40 (69.66)	54.60 (30.33)	26.60 (14.80)	28.00 (15.33)
35	*Pongamia pinnata (L.) Pierr.*	186.00 (100)	133.80 (71.94)	52.20 (28.05)	26.60 (14.27)	25.60 (31.78)
36	*Prosopis juliflora (SW.) DC.*	400.00 (100)	303.70 (75.93)	96.30 (24.07)	86.80 (21.70)	9.50 (02.37)
37	*Tamarindus indica L.*	284.40 (100)	256.20 (90.08)	28.60 (10.05)	10.00 (03.47)	18.80 (06.58)
38	*Tephrosia hamiltonii Drum*	303.16 (100)	192.48 (63.49)	110.68 (36.50)	86.88 (28.65)	23.76 (07.83)
39	*Trigonella foenum-gracum L.*	104.00 (100)	46.70 (44.92)	57.30 (55.07)	30.60 (29.38)	26.70 (25.69)
40	*Vigna unguiculata (L.) walp.*	173.80 (100)	105.00 (60.41)	68.80 (39.58)	45.90 (26.16)	23.30 (13.41)
41	*Acalypha indica L.*	237.00 (100)	158.70 (66.97)	78.30 (33.04)	42.60 (17.95)	35.60 (15.03)
42	*Achyranthes aspera L.*	188.00 (100)	129.30 (68.78)	58.80 (31.25)	35.70 (18.97)	23.00 (12.23)
43	*Adhatoda zeylanica Medic A. vasica Ness.*	242.70 (100)	180.40 (74.32)	62.30 (25.67)	32.10 (13.21)	30.20 (12.46)
44	*Ageratum conyzoides L.*	135.20 (100)	78.00 (57.67)	57.20 (42.32)	34.60 (25.55)	22.70 (16.77)
45	*Allamanda cathartica L*	182.00 (100)	126.70 (69.62)	55.10 (30.26)	21.40 (11.75)	33.70 (18.50)
46	*Alstonia macrophylla wall. Ex. G.Don*	270.00 (100)	186.30 (69.00)	83.80 (31.05)	35.10 (12.99)	48.80 (18.07)
47	*Alstonia scholaris (L.) R.Br.*	329.70 (100)	245.70 (74.52)	84.00 (25.47)	45.30 (13.73)	38.70 (11.74)
48	*Alternanthera sessilis (L.) R.Br.*	134.90 (100)	82.10 (60.88)	52.80 (39.11)	30.10 (22.30)	22.70(16 .81)
49	*Amaranthus hybridus L.*	153.80 (100)	80.00 (52.01)	73.80 (48.01)	56.60 (36.80)	17.24 (11.20)
50	*Amaranthus viridis L.*	193.00 (100)	99.80 (91.70)	93.20 (48.26)	64.40 (33.34)	28.80 (14.92)

51	*Amphilophium molle cham.et.schlecht.*	276.70 (100)	209.50 (75.72)	67.20 (24.47)	35.80 (12.95)	31.32(11 .31)
52	*Anethum graveolens L.*	110.00 (100)	40.00 (36.36)	70.00 (63.63)	22.00 (19.96)	48.00 (43.67)
53	*Annona squamosa L.*	290.00 (100)	176.40 (60.82)	113.80 (39.22)	91.60 (31.58)	22.00 (07.60)
54	*Azadirachta indica A. Juss.*	295.20 (100)	213.60 (73.10)	81.60 (27.64)	43.40 (14.76)	38.20 (12.94)
55	*Barleria cristata L.*	249.60 (100)	181.80 (72.82)	67.80 (27.14)	39.10 (15.67)	28.60 (11.45)
56	*Barleria prionitis L.*	260.80 (100)	192.00 (73.63)	68.80 (26.36)	21.60 (08.26)	47.20 (18.10)
57	*Callistemon rigidus R.Br.*	389.90 (100)	318.40 (81.65)	70.72 (18.13)	17.90 (04.59)	53.60 (13.74)
58	*Calotropis procera R.Br*	539.60 (100)	495.40 (91.80)	44.20 (08.19)	27.40 (05.07)	16.80 (03.10)
59	*Canna indica L.*	128.60 (100)	72.00 (55.97)	56.60 (44.02)	8.60 (06.71)	48.00 (37.31)
60	*Carissa congesta Wt.*	150.00 (100)	106.00 (70.66)	44.00 (29.33)	17.44 (11.62)	26.56 (17.70)
61	*Carthamus tinctorius L.*	312.00 (100)	276.10 (88.48)	35.80 (11.48)	9.80 (02.92)	26.70 (08.56)
62	*Clerodendrum inerme (L.) Gaerth.*	80.00 (100)	30.00 (37.50)	50.00 (62.50)	18.20 (22.70)	31.80 (39.80)
63	*Clerodendrum splendens G. Don*	170.00 (100)	112.30 (66.07)	58.00 (34.09)	21.60 (12.70)	36.20 (21.29)
64	*Crinum asiaticum L*	249.90 (100)	211.70 (84.69)	34.30 (15.30)	18.40 (07.34)	19.90 (07.95)
65	*Cynodon dactylon (L.)Pers.*	99.88 (100)	60.00 (60.07)	40.00 (39.22)	20.00 (19.90)	20.00 (20.02)
66	*Cyperus rotundus L.*	270.00 (100)	213.40 (79.5)	56.60 (20.94)	15.20 (05.64)	41.30 (15.30)
67	*Datura inoxia Mill.*	149.20 (100)	112.30 (75.25)	36.90 (24.74)	14.20 (09.54)	22.70 (15.20)
68	*Digitaria longiflora*	103.60	42.00	61.60	42.80 (41.25)	18.90

	(Retz.) pers.	(100)	(40.52)	(59.47)		(18.21)
69	*Doxantha unguis-cati (L.) Miers.*	172.40 (100)	144.70 (83.94)	27.70 (16.05)	11.00 (06.35)	16.70 (09.69)
70	*Duranta plumier Jacq.*	222.10 (100)	170.20 (76.64)	51.90 (23.35)	14.20 (06.39)	37.68 (16.96)
71	*Erigeron sublyratus DC.*	111.00 (100)	72.00 (64.86)	39.00 (35.13)	19.00 (17.08)	19.90 (17.94)
72	*Ipomoea cairica (L.) Sweet*	128.30 (100)	60.00 (46.75)	68.30 (53.24)	35.50 (27.68)	32.80 (25.56)
73	*Ipomoea campanulata L.Var.Illustric. Clarke*	100.00 (100)	59.80 (59.80)	40.20 (40.20)	32.00 (32.00)	8.10 (08.12)
74	*Jasminum calophyllum Wall. Ex. Clarke*	296.00 (100)	194.80 (65.81)	101.20 (34.18)	30.40 (10.27)	70.80 (23.91)
75	*Jasminum mexynyi Hance.*	320.00 (100)	170.20 (53.17)	150.10 (46.19)	53.50 (16.73)	96.50 (30.16)
76	*Kigelia pinnata (Jacq) DC.*	350.00 (100)	315.80 (90.24)	34.20 (09.76)	15.90 (04.54)	18.20 (05.21)
77	*Lantana camara L.*	272.00 (100)	229.80 (84.50)	42.50 (15.61)	19.40 (07.14)	23.00 (08.47)
78	*Launaea procumbens (Roxb.)Ramayya & Raj.*	65.80 (100)	34.00 (51.67)	31.80 (48.32)	18.70 (28.38)	13.10 (19.93)
79	*Malvastrum coromadelianum (L.) Garcke*	192.30 (100)	161.80(84.15)	30.50(15.84)	16.30(08.46)	14.20(04.68)
80	*Menthe spicata L.*	158.00 (100)	103.60 (65.56)	54.40 (34.43)	39.80 (35.18)	14.60 (09.24)
81	*Moringa oleifera Lamk.*	220.00 (100)	138.80 (63.07)	81.20 (36.92)	34.00 (15.45)	47.20 (21.47)
82	*Murraya koenigii (L.) Spreng.*	359.80 (100)	261.70 (72.74)	78.10 (27.25)	32.00 (08.89)	66.10 (18.36)
83	*Ocimum tenuiflorum L.*	190.00 (100)	106.40 (56.00)	83.40 (43.87)	61.20 (32.23)	22.00 (11.60)
84	*Pachypetra hymenaea (DC.) Gentry.*	386.80 (100)	297.00 (76.77)	89.80 (23.22)	64.50 (16.68)	25.30 (6.55)
85	*Parthenium*	140.00	81.50	58.50	41.60 (29.68)	17.00

	hysterophors L.	(100)	(58.22)	(41.77)		(12.08)
86	*Peristrophe paniculata (forssk.) Brummit*	200.00 (100)	122.50(61.26)	77.50 (38.74)	49.40 (24.72)	28.00 (14.02)
87	*Polyalthia longifolia (sonner) Thw.*	429.60 (100)	378.00 (87.98)	51.60 (12.01)	20.20 (04.70)	31.40 (07.31)
88	*Pyrostegia venusta (Ker-Gawl) Miers.*	200.00 (100)	142.80 (71.40)	57.20 (28.60)	10.40 (05.20)	46.80 (23.40)
89	*Rumex vesicarius L.*	46.00 (100)	24.80 (53.82)	21.20 (46.17)	8.20 (17.82)	13.00 (28.34)
90	*Setaria verticillaa (L.) P. Beauv.*	130.00 (100)	88.80 (68.33)	41.20 (31.66)	18.20 (14.00)	23.00 (17.66)
91	*Solanum nigrum L.*	112.40 (100)	52.50 (46.70)	59.90 (53.29)	32.40 (28.82)	27.50 (24.46)
92	*Spathodea campanulata p. Beauv.*	310.00 (100)	228.00 (73.54)	82.00 (26.45)	37.36 (12.05)	44.60 (14.40)
93	*Spilanthes paniculata Wall.ex.DC.*	264.20 (100)	217.50 (82.31)	46.70 (17.68)	15.80 (05.96)	31.00 (11.71)
94	*Spinacia oleracea L.*	80.00 (100)	36.70 (45.90)	43.30 (54.10)	23.50 (29.40)	19.80 (2470)
95	*Stereospermum suaveolens (Roxb.) DC.*	302.00 (100)	253.70 (84.01)	48.30 (15.98)	30.80 (10.17)	17.60 (05.14)
96	*Tagetes patula L.*	130.00 (100)	60.00 (46.15)	70.00 (53.84)	36.10 (27.78)	33.90 (26.06)
97	*Tecoma stans (L.) H.B.K. Nov.*	240.00 (100)	142.60 (59.40)	97.90 (40.78)	47.00 (19.56)	50.70 (21.11)
98	*Thevetia peruviana (pers.) K. Schum*	288.60 (100)	140.30 (61.36)	88.63 (68.63)	40.10 (17.53)	48.20 (21.10)
99	*Tridax procumbens L.*	129.90 (100)	88.00 (67.75)	41.90 (32.24)	12.90 (09.60)	29.40 (22.63)
100	*Wedelia chinensis (Roxb). Mill*	151.90 (100)	96.00 (63.19)	55.90 (36.80)	46.40 (30.51)	10.00 (06.29)
		246.00 (100) 106.11 43.13	185.00 (75.20) 101.24 54.73	66.00 (25.80) 25.81 39.10	34.80 (14.14) 22.11 63.54	28.70 (11.66) 16.35 56.97

Table 3 : Distribution of Nitrogen (mg) during fractionation of 1 kg green foliage (Contd.)

Sr. No.	Plants	Fresh Crop	Pressed Crop	Leaf Juice	Leaf Protien Concentrate	Deproteinized Juice
1	*Acacia chundra (Roxb. ex Rottl.) willd*	14652 (100)	13296 (90.70)	1328 (09.10)	1144 (07.80)	180 (01.20)
2	*Acacia leucophloea (Roxb) wild*	12872 (100)	11780 (91.51)	1060 (08.23)	940 (07.30)	124 (00.96)
3	*Acacia nilotic (L.) Del sub. Sps. Indica*	11048 (100)	9360 (84.72)	1648 (14.91)	1424 (12.88)	236 (02.13)
4	*Acacia pennata (L.) Willd.*	10980 (100)	8760 (79.78)	2170 (19.76)	2000 (18.21)	160 (01.45)
5	*Albizia amara (Roxb.) Bovin*	1338 (100)	1099 (82.13)	2480 (18.53)	2050 (52.32)	430 (03.21)
6	*Alysicarpus tetragonolobus Edgew.*	11440 (100)	3116 (27.23)	8304 (72.58)	8188 (71.57)	116 (01.01)
7	*Arachis hypogaea L.*	6390 (100)	4360 (68.23)	1990 (31.14)	1700 (26.60)	280 (04.38)
8	*Bauhinia variegate L.*	11264 (100)	5272 (46.80)	5996 (53.23)	4823 (42.89)	1164 (10.33)
9	*Caesalpinia pulcherrima (L.) swartz*	8132 (100)	6720 (82.63)	1392 (17.11)	1164 (14.31)	228 (02.80)
10	*Canjus cajan (L.) mill.*	11412 (100)	8820 (77.28)	2512 (22.01)	2076 (18.19)	420 (03.68)
11	*Cassia auriculata L.*	10616 (100)	7452 (70.19)	3152 (29.69)	2832 (26.67)	312 (02.93)
12	*Cassia australis L.*	14796 (100)	10056 (67.96)	4756 (32.14)	4464 (30.17)	288 (01.94)
13	*Cassia fistula L.*	11228 (100)	8864 (78.94)	2320 (20.66)	2164 (19.27)	512 (01.35)
14	*Cassia roxburghii DC.*	9560 (100)	8004 (83.72)	1576 (16.48)	1424 (14.89)	152 (01.58)

15	*Cassia siamea Lamk*	9696 (100)	5596 (57.71)	4084 (42.12)	3472 (35.80)	616 (06.35)
16	*Cassia tor L.*	7564 (100)	4336 (56.75)	3244 (42.88)	2996 (39.60)	232 (03.06)
17	*Cicer arientinum L.*	9616 (100)	4596 (47.79)	4984 (51.83)	4832 (50.24)	160 (01.66)
18	*Crotalaria notonii wt & Arm.*	10284 (100)	3840 (37.33)	6460 (62.81)	5700 (55.42)	752 (07.31)
19	*Dalbergia sissoo Roxb.ex. DC.*	12424 (100)	6568 (58.86)	5860 (47.16)	4484 (36.09)	1372 (11.04)
20	*Delonix regia (Bojer) Raf.*	11448 (100)	7876 (68.79)	3548 (30.99)	3028 (26.45)	520 (04.54)
21	*Desmodium gangeticum (L.)DC.*	16624 (100)	12564 (75.57)	4044 (24.32)	3420 (20.57)	628 (03.77)
22	*Lablab purpurea (L.) Sweet*	8156 (100)	3808 (46.68)	4364 (53.50)	4068 (49.87)	296 (03.62)
23	*Erythrina suberosa Roxb.*	8436 (100)	3488 (41.34)	42.94(58.36)	4172 (49.45)	752 (08.91)
24	*Erythrina variegate L.*	7088 (100)	3448 (48.64)	3636 (51.29)	3392 (47.85)	244 (03.44)
25	*Gliricidia sepium (Jacq.) Kunth*	8200 (100)	4476 (54.58)	3702 (45.37)	3372 (41.12)	348 (04.24)
26	*Goniogyna binata Roxb.*	8324 (100)	6708 (80.43)	1612 (19.36)	1368 (16.43)	236 (02.83)
27	*Hardwidwidckia binata Roxb.*	7500 (100)	5184 (69.12)	2320 (30.93)	1832 (24.42)	488 (06.54)
28	*Indigofera cordifolia Heyne ex. Roth*	7824 (100)	5668 (72.44)	2176 (27.81)	1960 (25.05)	216 (02.76)
29	*Indigofera duthiei Drum. Ex. Naik*	7536 (100)	4752 (63.05)	2840 (37.68)	2660 (35.35)	188 (02.94)
30	*Millettia ovalifolia L.*	7244 (100)	5592 (77.19)	1648 (22.74)	1400 (19.32)	248 (03.42)
31	*Parkia bigladulosa wt & Arm.*	10696 (100)	9488 (88.70)	1212 (11.33)	1080 (10.09)	128 (01.19)
32	*Peltophorum*	11312	9148	2164 (19.13)	1572	592 (05.23)

	pterocarpum (DC.) Baker	(100)	(80.86)		(13.89)	
33	*Phaseolus radiates L.*	8772 (100)	5252 (59.87)	3508 (39.99)	3192 (36.38)	312 (03.55)
34	*Phaseolus radiates L. var. Kopergaon*	5688 (100)	3448 (60.48)	2268 (39.87)	1796 (31.57)	464 (08.15)
35	*Pongamia pinnata (L.) Pierr.*	6060 (100)	3892 (64.22)	21.68 (35.77)	1660 (27.39)	512 (08.44)
36	*Prosopis juliflora (SW.) DC.*	11640 (100)	5312 (45.63)	6332 (54.39)	6212 (53.36)	116 (00.99)
37	*Tamarindus indica L.*	7832 (100)	6812 (86.97)	1020 (13.02)	540 (06.89)	468 (05.97)
38	*Tephrosia hamiltonii Drum*	11606 (100)	5600 (48.24)	5984 (51.55)	5496 (47.34)	488 (04.20)
39	*Trigonella foenum-gracum L.*	6144 (100)	1752 (28.51)	4388 (71.41)	3564 (58.00)	820 (13.34)
40	*Vigna unguiculata (L.) walp.*	6080 (100)	2360 (38.81)	3720 (61.18)	3296 (54.21)	424 (06.97)
41	*Acalypha indica L.*	10072 (100)	5012 (49.76)	5088 (50.51)	3828 (38.00)	1184 (11.75)
42	*Achyranthes aspera L.*	6260 (100)	3232 (51.62)	3032 (48.43)	1812 (28.94)	1148 (18.33)
43	*Adhatoda zeylanica Medic A. vasica Ness.*	8080 (100)	4796 (59.35)	3268 (40.44)	2456 (30.39)	804 (09.95)
44	*Ageratum conyzoides L.*	4500 (100)	1880 (41.77)	2620 (58.22)	2360 (52.44)	260 (05.77)
45	*Allamanda cathartica L*	5748 (100)	4320 (75.15)	1376 (23.93)	1068 (18.58)	304 (05.28)
46	*Alstonia macrophylla wall. Ex. G.Don*	5156 (100)	3260 (63.22)	1884 (36.53)	1632 (31.65)	244 (04.73)
47	*Alstonia scholaris (L.) R.Br.*	5472 (100)	2848 (52.04)	2584 (47.22)	2336 (42.69)	252 (04.60)
48	*Alternanthera*	3924	1156	2768 (70.54)	2104	656 (16.71)

	sessilis (L.) R.Br.	(100)	(29.45)		(53.61)	
49	*Amaranthus hybridus L.*	7548 (100)	2128 (28.19)	5468 (72.44)	4712 (62.42)	760 (10.06)
50	*Amaranthus viridis L.*	4168 (100)	656 (15.73)	3492 (83.78)	3056 (73.32)	432 (10.36)
51	*Amphilophium molle cham.et.schlecht.*	1427 (100)	10284 (72.03)	3968 (27.79)	2384 (16.69)	1588 (11.12)
52	*Anethum graveolens L.*	5224 (100)	834 (15.92)	4380 (83.84)	2412 (46.17)	1960 (37.51)
53	*Annona squamosa L.*	8700 (100)	4108 (47.21)	4548 (52.27)	4348 (49.97)	220 (02.52)
54	*Azadirachta indica A. Juss.*	8856 (100)	5680 (64.13)	3124 (35.27)	2528 (28.54)	600 (06.77)
55	*Barleria cristata L.*	5188 (100)	3324 (64.07)	1800 (34.69)	1368 (26.36)	428 (08.24)
56	*Barleria prionitis L.*	6284 (100)	3840 (61.10)	2404 (38.25)	1580 (25.14)	826 (13.11)
57	*Callistemon rigidus R.Br.*	7756 (100)	5824 (77.09)	1900 (24.49)	744 (09.59)	1156 (14.90)
58	*Calotropis procera R.Br*	5824 (100)	4952 (85.02)	952 (16.34)	864 (14.83)	80 (01.37)
59	*Canna indica L.*	2776 (100)	776 (27.95)	1980 (71.32)	864 (31.12)	1116 (40.20)
60	*Carissa congesta Wt.*	3000 (100)	1588 (52.93)	1388 (46.26)	928 (30.93)	464 (15.46)
61	*Carthamus tinctorius L.*	6736 (100)	5520 (81.94)	1192 (17.69)	684 (10.15)	508 (07.54)
62	*Clerodendrum inerme (L.) Gaerth.*	3728 (100)	824 (22.10)	2912 (78.11)	1692 (45.38)	1216 (32.61)
63	*Clerodendrum splendens G. Don*	4944 (100)	2808 (56.79)	2120 (42.88)	1796 (36.32)	328 (06.63)
64	*Crinum asiaticum L*	7496 (100)	5988 (79.88)	1492 (19.90)	1220 (16.27)	264 (03.52)
65	*Cynodon dactylon (L.)Pers.*	2626 (100)	748 (28.16)	1892 (71.23)	1420 (53.46)	464 (17.46)

66	*Cyperus rotundus L.*	8988 (100)	5868 (65.28)	3108 (34.57)	1456 (16.19)	1652 (18.38)
67	*Datura inoxia Mill.*	4340 (100)	3456 (79.63)	860 (19.81)	652 (15.02)	204 (04.70)
68	*Digitaria longiflora (Retz.) pers.*	5264 (100)	1048 (19.90)	4208 (79.93)	3632 (68.99)	580 (11.01)
69	*Doxantha unguis-cati (L.) Miers.*	3876 (100)	2532 (65.32)	1336 (44.46)	864 (22.29)	472 (12.17)
70	*Duranta plumier Jacq.*	5172 (100)	4100 (79.27)	1036 (20.03)	756 (14.61)	280 (05.41)
71	*Erigeron sublyratus DC.*	3696 (100)	2340 (63.61)	1264 (34.19)	1104 (29.87)	164 (04.43)
72	*Ipomoea cairica (L.) Sweet*	3208 (100)	4048 (32.66)	2156 (67.20)	2008 (62.59)	164 (05.11)
73	*Ipomoea campanulata L.Var.Illustric. Clarke*	4660 (100)	2392 (51.33)	2272 (48.75)	2084 (44.72)	188 (04.03)
74	*Jasminum calophyllum Wall. Ex. Clarke*	7636 (100)	6152 (80.56)	1516 (19.85)	1216 (15.92)	288 (03.77)
75	*Jasminum mexynyi Hance.*	6400 (100)	3112 (48.62)	3240 (50.62)	2852 (44.56)	392 (06.12)
76	*Kigelia pinnata (Jacq) DC.*	6404 (100)	5204 (81.26)	1164 (18.17)	940 (14.67)	228 (03.56)
77	*Lantana camara L.*	8160 (100)	6892 (84.46)	1200 (14.70)	904 (11.07)	288 (03.57)
78	*Launaea procumbens (Roxb.)Ramayya & Raj.*	2960 (100)	1020 (34.45)	1932 (65.27)	1772 (59.86)	164 (05.54)
79	*Malvastrum coromadelianum (L.) Garcke*	7692 (100)	5664 (73.63)	2028 (26.36)	1488 (19.34)	540 (07.02)
80	*Menthe spicata L.*	6444	3624	2856 (44.32)	2320	532 (08.25)

		(100)	(56.23)		(36.00)	
81	*Moringa oleifera Lamk.*	9700 (100)	6588 (67.91)	3108 (32.04)	2124 (21.89)	980 (10.10)
82	*Murraya koenigii (L.) Spreng.*	8380 (100)	5440 (64.91)	2940 (35.08)	1488 (17.75)	1484 (17.70)
83	*Ocimum tenuiflorum L.*	5052 (100)	2212 (43.78)	2772 (54.86)	2544 (50.35)	200 (03.95)
84	*Pachypetra hymenaea (DC.) Gentry.*	13536 (100)	7896 (58.33)	5612 (41.45)	4456 (32.91)	1156 (08.54)
85	*Parthenium hysterophors L.*	5360 (100)	2372 (44.25)	2968 (55.37)	2420 (45.14)	548 (10.22)
86	*Peristrophe paniculata (forssk.) Brummit*	9500 (100)	3564 (37.51)	5932 (62.44)	4404 (46.35)	1516 (15.95)
87	*Polyalthia longifolia (sonner) Thw.*	8592 (100)	7560 (87.98)	944 (10.98)	688 (08.00)	260 (03.02)
88	*Pyrostegia venusta (Ker-Gawl) Miers.*	5660 (100)	3084 (54.48)	2572 (45.44)	864 (15.60)	1712 (30.24)
89	*Rumex vesicarius L.*	2372 (100)	1380 (58.17)	972 (40.97)	580 (24.45)	388 (16.35)
90	*Setaria verticillaa (L.) P. Beauv.*	4756 (100)	2068 (43.48)	2672 (56.18)	1800 (37.84)	876 (18.41)
91	*Solanum nigrum L.*	4110 (100)	960 (23.35)	3140 (76.39)	2750 (66.90)	385 (09.36)
92	*Spathodea campanulata p. Beauv.*	5144 (100)	4196 (81.57)	948 (18.42)	776 (15.08)	180 (03.49)
93	*Spilanthes paniculata Wall.ex.DC.*	9904 (100)	6524 (65.87)	3384 (34.16)	1220 (12.31)	2164 (21.84)
94	*Spinacia oleracea L.*	4528 (100)	1560 (34.45)	2956 (65.28)	2468 (54.50)	492 (10.86)
95	*Stereospermum suaveolens (Roxb.)*	5280 (100)	3570 (67.61)	1680 (31.81)	1530 (28.92)	140 (02.65)

	DC.					
96	*Tagetes patula L.*	4328 (100)	996 (23.01)	3324 (76.80)	3008 (69.50)	280 (06.46)
97	*Tecoma stans (L.) H.B.K. Nov.*	4800 (100)	2492 (51.91)	2356 (49.08)	2112 (44.00)	252 (05.25)
98	*Thevetia peruviana (pers.) K. Schum*	5712 (100)	2452 (42.92)	3232 (56.98)	2836 (49.64)	400 (07.00)
99	*Tridax procumbens L.*	4428 (100)	3148 (71.09)	1256 (28.36)	1036 (23.39)	220 (04.96)
100	*Wedelia chinensis (Roxb). Mill*	2900 (100)	1036 (35.72)	1860 (64.13)	1620 (55.86)	236 (08.13)
	Mean =	7440	4620	2810 (30.77)	2290	530 (7.12)
	S.D =	(100)	62.09)	1514.56	(30.77)	436.69
	C.V. =	3156.96	2824.11	53.90	1478.48	82.39
		42.43	61.13		64.56	