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Studies on preparation and evaluation of value added products from *Giloy (Tinospora cordifolia)*

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Abstract

Giloy is rich in nutritional and therapeutic values. It is consumed by the people in the form of decoction to cure certain ailments. The plant is well known for its phyto-chemical constituents. There was an urgent need for recognition of medicinal properties of *giloy* and to prepare certain value added products. Results of the study revealed that *Giloy* contains good amount of crude fibre (5.72) and ash content (6.35%). It is also rich in various minerals, especially calcium and iron (9.41 and 0.29 mg/100g, respectively). An attempt has been made to utilize *giloy* stem samples for the preparation of value added products viz. RTS, squash and syrup. The prepared products were assessed for chemical, nutritional and sensory parameters. All the beverages prepared from *Giloy* were acceptable. The blending of kinnow further improved the sensory quality as well. In the present scenario, where lot of emphasis is being laid on the consumption of healthy food, development of such products might help the consumers to harness the nutritional and medicinal properties of such unexploited locally available herb.

Key words: *Giloy*, *Kinnow*, RTS, squash, syrup, chemical evaluation, nutritional evaluation, sensory evaluation

Since the past decade, the therapeutic use of herbal medicine is gaining considerable momentum in the world. Due to toxicity and side effects of allopathic medicines, there is an increased rely on use of herbal medicines. Approximately, 80% of the population of our country use traditional medicines for their primary health care. So there is a great need for the recognition of the medicinal and economic benefits of flora and fauna grown in the lap of Himalayas.

Tinospora cordifolia (*Menispermaceae*) commonly known as *Giloy*, a Hindu mythological term is refers to the heavenly Elixir. *Giloy* is used in the traditional medicinal system since ages. Its stem and roots are used as herbal remedies. The plant is a large, glabrous, deciduous climbing shrub and distributed throughout subtropical and tropical Indian sub-continent, extending from the Himalayas down to the southern part of Peninsular India. The stem is bitter in taste and stimulates bile secretion, stomachic, diuretic and cures jaundice. It is a best remedy for children suffering from upper respiratory tract infections (Vedavathy and Rao 1991). The crude extract of dry stem of *Tinospora cordifolia* enhanced immune responses (Manjrekar et al. 2000). The extract of *cordifolia* has an anti- hyperglycemic property (Rajalakshmi et al. 2009).

It might increase the leucocytes and phagocytic cells (Dikshit et al. 2000). Traditionally people consume it in the crude form as a remedial measure in certain ailments. No work has been reported on the estimation of quality attributes and product development of *Giloy*. So, keeping in view its therapeutic as well as nutritional values, the present study was envisaged with the objective of the development and evaluation of value added product by using its stems.

Materials and Methods

The present investigation was conducted at Palampur with the raw material procured locally. The stems were cleaned, washed properly to remove any dust and debris. The juice was extracted as explained in Fig 1.

Development of Beverages (RTS, Squash, Syrups) by using *Giloy* stems

Preliminary work was done to standardize the recipe for beverages by using various blends of juices (*Giloy* and Kinnow). The prepared samples were offered to judges to know best level of proportion of fruits with plant juices. The treatments were 100% G (*Giloy*) [T_0], 75 G:25 K (*Kinnow*) [T_1], 50 G:50 K (*Kinnow*)[T_2], 25 G:75 K (*Kinnow*) [T_3] and 100% K (*Kinnow*)[T_4]. The stored juice was used for the preparation of value added products as per FSSAI specification.

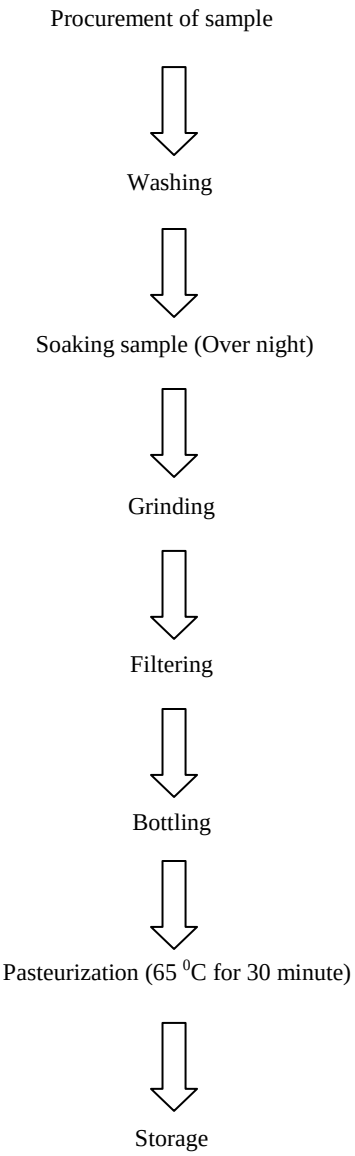

Fig 1. Unit operations for the extraction of juice

The prepared samples were evaluated for physical, chemical, nutritional and organoleptic evaluation by using standard techniques.

Physical evaluation

The colour and shape of the samples were observed from their physical appearance through visual perception. Whereas weight was recorded by taking ten cut pieces of equal sized stem of *Giloy* in triplicate on an electrical weighing balance. The length was measured by using ten cut pieces of equal sized stem of *Giloy* in triplicate. The circumference was measured by taking ten cut pieces of equal sized stem of *Giloy* in triplicate. Diameter was measured with the help of a vernier caliper and circumference was obtained by dividing the diameter by two.

Chemical and nutritional evaluation

The proximate composition was done by using standard methods prescribed by AOAC (1990). ADF and NDF were estimated by the methods of Soest and Wine (1967). The various nutritional parameters viz. pH, TSS, acidity, ascorbic acid, minerals and sugars were estimated by following the methods given by Rangana (1995).

Organoleptic evaluation

The organoleptic evaluation was done as per the method suggested by Gould (1978). The sensory attributes like colour, flavour, taste, consistency and overall acceptability of the products were evaluated. A minimum of 10 judges were selected at random to record their preference and acceptability of the products on the evaluation sheets.

Results and Discussion

Physical evaluation

Giloy stem was evaluated physically in terms of colour, shape, weight and circumference. The colour of the *Giloy* stem was light brown. Shape of the test species delineated in the Plate 1 was found to be cylindrical. The Table 1 shows the mean length 4.50 cm of the *Giloy* stem cut pieces weighing 1.71 g. The circumference of *Giloy* stem was established as 0.40. Raoof and Siddiqui (2012) reported the sample length 8.32±0.13 cm in *Giloy* stem. However, varietal differences, agro climatic conditions, maturity and the time of the harvesting might have made variation.

Sample	*Giloy*
Length (cm)	4.50
Weight (g)	1.71
Circumference (cm)	0.40
Color	Light brown
Shape	Cylindrical

Chemical evaluation

Moisture (%), protein and fat contents in *Giloy* stems were observed as 10.63, 2.13 and 1.92, respectively (Table 2). Ash gave insight of the mineral composition which came out to be 6.35%. The crude fibre was 5.72%. NDF and ADF were 24.80 and 33.80%, respectively. Nile and Khobragade (2009) have reported the values for ash

a. Shrub

b. Fresh stem

c. Dry stem

A. Powder

Plate 1. Physical appearance of *Giloy*

(12.40%), moisture (18.34%), crude fat (3.10%), crude protein (4.50%) and crude fibre (15.90%) of *Giloy* stem as closer as our values. A slight variation in some of the parameters might be due to the varietal differences, agro climatic conditions, maturity and the time of the harvesting.

Table 2. Proximate composition of *Giloy*

Parameters	*Giloy* (%)
Moisture Content	10.63
Protein	2.13
Fat	1.92
Ash	6.35
Crude Fibre	5.72
NDF	24.80
ADF	25.20

Each value representing the mean of three values

Nutritional evaluation of freshly prepared *Giloy: Kinnow* based RTS

An effort was made to prepare the *Giloy* RTS *(Ready to serve)* blended with the kinnow not only to improve the taste but also to improve the appearance and nutritional value. A critical visualization of data in Table 3 revealed that TSS of Giloy based RTS ranged from 13.99 to 14.71 ^{o}Brix. The values of the total solids were observed as 13.99, 14.50, 13.53, 14.31, 14.71 for T_o, T_1, T_2, T_3, T_4, respectively.

The pH values for the RTS beverage under T_o, T_1, T_2, T_3, T_4 were 5.63, 5.71, 4.68, 3.56 and 2.24, respectively. The per cent values for acidity were 0.26, 0.41, 0.68, 0.99, 1.45 in T_1, T_2, T_3, T_4, and T_5, respectively. The ascorbic acid value ranged from 3.50 to 3.82 mg/100g. The values for the per cent total sugars were recorded as 9.30, 9.28, 9.10, 9.18 and 4.78, for reducing sugars 2.95, 2.90, 2.86, 2.83 and 1.90% and for non-reducing sugars, 6.680, 6.71, 6.56, 6.84 and 3.03% under T_o, T_1, T_2, T_3 and T_4, respectively.

Organoleptic evaluation of freshly prepared *Giloy: Kinnow based* RTS

The prepared products were also evaluated organoleptically. The products were offered to a panel of judges and according to their preference sensory parameters are depicted in Table 4. The score for colour of RTS were recorded to be as 7.38, 7.30, 7.14, 7.65, 8.16 for treatments T_o, T_1, T_2, T_3, T_4, respectively. The scores for flavour were ranged from 6.25 to 7.54 for T_o and T_4, respectively. The scores for the taste of RTS were 7.93 for T_4 most accepted, 7.16 for T_2 intermediate and 5.02 for T_o the lowest accepted treatment.

The treatment T_4 was most preferred (8.09) by the judges followed by the T_3 (7.72) and T_2 (7.32) for the overall acceptability. The scores for the consistency were ranged from 8.06 to 8.73 for all the five treatments. Bharmoria (2011) confirms the present finding for fresh samples analysis of *Giloy beverages.*

Nutritional evaluation of freshly prepared *Giloy: Kinnow* based squash

Table 5 represents the values for total soluble solids in ^{o}Brix for syrup. It is clear that the values of the total soluble solids were observed to be 44.90, 44.91, 44.55, 44.05, 45.00 ^{o}Brix for T_o, T_1, T_2, T_3, T_4., respectively. The pH value for the squash beverage was 5.66, 5.76, 4.72, 3.60, and 2.28 for T_o, T_1, T_2, T_3 and T_4, respectively. The acidity per cent value for T_o, T_1, T_2, T_3, T_4., were observed as 0.31,

Table 3. Nutritional parameters of freshly prepared *Giloy: Kinnow* based RTS

Parameters	Treatment				
	T_0	T_1	T_2	T_3	T_4
TSS (^{0}Brix)	13.99	14.50	13.53	14.31	14.71
pH	5.63	5.71	4.68	3.56	2.24
Acidity (%)	0.26	0.41	0.68	0.99	1.45
Ascorbic acid (mg/100g)	3.82	3.79	3.50	3.80	3.78
Total sugars (%)	9.30	9.28	9.10	9.18	4.78
Reducing sugars (%)	2.95	2.90	2.86	2.83	1.90
Non-reducing sugars (%)	6.68	6.71	6.56	6.84	3.03

Each value representing the mean of three values

Table 4. Sensory scores of freshly prepared *Giloy: Kinnow* based RTS

Parameters	Treatment				
	T_0	T_1	T_2	T_3	T_4
Color	7.38	7.30	7.14	7.65	8.16
Flavour	6.25	6.67	6.82	7.27	7.54
Taste	5.02	6.21	7.16	7.61	7.93
Consistency	8.06	8.02	8.14	8.36	8.73
Over all acceptability	6.68	7.05	7.32	7.72	8.09

Each value representing the mean of three values

Table 5. Nutritional parameters of freshly prepared *Giloy: Kinnow* based squash

Parameters	Treatment				
	T_0	T_1	T_2	T_3	T_4
TSS (^{0}Brix)	44.90	44.91	44.55	44.05	45.00
pH	5.66	5.76	4.72	3.60	2.28
Acidity (%)	0.31	0.46	0.72	1.06	1.50
Ascorbic acid (mg/100g)	2.49	3.83	4.51	5.45	8.96
Total sugars (%)	31.58	31.39	30.08	31.36	31.00
Reducing sugars (%)	11.11	11.01	10.95	11.05	11.07
Non-reducing sugars (%)	21.54	21.48	20.13	21.37	20.97

Each value representing the mean of three values

0.46, 0.72, 1.06, and 1.50, respectively. The ascorbic acid value for treatments T_o, T_1, T_2, T_3, T_4., was 2.49, 3.83, 4.51, 5.45, 8.96 mg/100 g, respectively. The value for total sugars was 31.58, 31.39, 30.08, 31.36, 31.00%; reducing sugars 11.11, 11.01, 10.95, 11.05, 11.07% and non-reducing sugar as 21.54, 21.48, 20.13, 21.37, 20.97 for T_o, T_1, T_2, T_3, T_4, respectively.

Organoleptic evaluation of freshly prepared *Giloy: Kinnow* based squash

The prepared products were also evaluated organoleptically. The products were offered to a panel of judges and according to their preference sensory parameters are depicted in the Table 6.

The score for colour of squash beverage was recorded as 7.38, 7.30, 7.14, 7.65 & 8.16 for T_o, T_1, T_2, T_3 & T_4, respectively. The score for flavour was 6.25, 6.67, 6.82, 7.27 and 7.54 for T_o, T_1, T_2, T_3 and T_4, respectively. The score for the taste ranged from 5.02 to 7.93 for T_o to T_4, respectively. Scores revealed that T_3 was most acceptable followed by T_4 (7.86) to T_1 (6.56). The score for the consistency was ranged from 7.60 (T_0) to 7.83 (T_3).

***Giloy* Syrup**

An effort was also made to prepare *Giloy* syrup blended with the *kinnow* to improve the appearance and the nutritional value.

Nutritional evaluation of freshly prepared *Giloy: Kinnow* based Syrup

Table 7 includes values for the different nutritional components under different treatments of syrup beverage.

The values for total soluble solids were observed to be 68.01 (T_o), 68.01 (T_1), 68.02 (T_2), 67.67 (T_3), 68.04 (T_4) ^{o}Brix for the squash beverage. The pH value for the syrup beverage were observed as 5.60 (T_o), 5.74 (T_1), 4.69 (T_2), 3.58 (T_3) and 2.24 (T_4), respectively. The per cent acidity values for syrup were observed as 0.29, 0.43, 0.69, 1.04, 1.47 for T_o, T_1, T_2, T_3, T_4, respectively. The values for the ascorbic acid were observed to be 4.50, 4.57, 4.57, 4.53, 5.43 mg/100g for treatment T_o, T_1, T_2, T_3, T_4, respectively. The per cent value for total sugars were recorded to be 62.54, 62.43, 61.12, 61.71,

Table 6. Sensory scores of freshly prepared *Giloy: Kinnow* based squash

Parameters	Treatments				
	T_0	T_1	T_2	T_3	T_4
Color	7.38	7.30	7.14	7.65	8.16
Flavour	6.25	6.67	6.82	7.27	7.54
Taste	5.02	6.21	7.16	7.61	7.93
Consistency	7.60	7.66	7.63	7.83	7.80
Overall acceptability	6.56	6.96	7.19	7.59	7.86

Each value representing the mean of three values

Table 7. Nutritional parameters of freshly prepared *Giloy: Kinnow* based Syrup

Parameters	Treatments				
	T_0	T_1	T_2	T_3	T_4
TSS (^{0}Brix)	68.01	68.01	68.02	67.67	68.04
pH	5.60	5.74	4.69	3.58	2.24
Acidity (%)	0.29	0.43	0.69	1.04	1.47
Ascorbic acid (mg/100g)	4.50	4.57	4.57	4.53	5.43
Total sugars (%)	62.54	62.43	61.12	61.71	61.41
Reducing sugars (%)	28.44	27.45	26.95	26.29	26.49
Non-reducing sugars (%)	35.89	36.83	35.97	37.28	36.78

Each value representing the mean of three values

61.41 per cent for T_o, T_1, T_2, T_3, T_4, respectively. The values for reducing sugars were 28.44, 27.45, 26.95, 26.29, 26.49 and for the non-reducing sugars 35.89, 36.83, 35.97, 37.28, 36.78 for T_o, T_1, T_2, T_3, T_4, respectively.

Organoleptic evaluation of freshly prepared *Giloy: Kinnow* based Syrup

The organoleptical evaluation according to the panel/ consumer acceptance has been depicted in Table 8. Score for colour of squash beverage was 7.04, 7.28, 7.28 7.57 and 7.78 for T_o, T_1, T_2, T_3 and T_4, respectively. The trend was similar for flavour, taste and consistency, T_0 having lowest score and T_4 had highest.

Score for overall acceptability showed that the T_4 was most acceptable with score 7.97 followed by T_3 with score 7.79. The score for consistency was ranged from 7.60 to 7.83 for all the five treatments.

From the beverages *viz.* Ready to Serve (RTS), squash and syrup made from *Giloy*, it was found that control beverages i.e. 100% *Giloy* have the best consistency when compared with other blend ratio. The value added products prepared from *Giloy* could be exploited commercially in order to add variety, improve overall health and can be good alternatives for the health conscious persons.

Table 8. Sensory scores of freshly prepared *Giloy: Kinnow* based Syrup

Parameter	Treatment				
	T_0	T_1	T_2	T_3	T_4
Color	7.04	7.28	7.28	7.57	7.78
Flavour	6.17	6.54	6.92	**7.64**	7.96
Taste	6.25	6.29	6.67	7.34	7.87
Consistency	7.13	7.56	7.92	8.62	8.26
Over all acceptability	6.65	6.92	7.19	7.79	7.97

Each value representing the mean of three values

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