Nutritional Evaluation of Five Wild Vegetables Used in the Khandesh Region

Chaudhari Smita, Jethave Ganesh, Chaudhari Aditi and Lad Rutuja

Dr. Annasaheb G. D. Bendale Mahila Mahavidyalaya, Jalgaon

Abstract

Vegetables are good source of nutrients. There are several under-exploited wild vegetables. Five wild vegetables investigated in the present study are *Cassia toraL., Basella alba L. Hibiscus cannabinus L, Portulaca quadrifida L. RiveahypocrateriformisDesr*. The objectives of present study were estimation of nutritional parameters of these wild vegetables and popularization of wild vegetables. Nutritional analysis revealed that maximum Moisture content and Ash content was in *Basella alba L. and Cassia tora* L respectively. Maximum crude fibres were found in *Hibiscus cannabinus L.* Maximum proteins and lipids were found in *Hibiscus cannabinus L.* Maximum carbohydrates were in *RiveahypocrateriformisDesr.* All the studied vegetables have good amount of nutrients and crude fibres. Hence, use of wild vegetables in our daily diet as much as possible is essential to make our life healthier. These wild vegetables can be used as nutraceuticals.

Keywords: Wild vegetables, moisture content, ash content, crude fibres, proteins, lipids, carbohydrates.

1. Introduction

Vegetables play a vital role in maintaining and improving health in this modern era. Humans are facing multiple health issues because of low nutrition and improper diet habits and excessive use of chemicals during cultivation of vegetables and crops. Therefore, the use of wild vegetables in our diet as much as possible is essential as they have good nutritive value and various medicinal properties and are free from fertilizers and pesticides. They are available for a short period and highly perishable in nature having short shelf life.

There are several local and wild vegetables which are under-exploited because of inadequate scientific knowledge of their nutritional parameters. In the present work we have studied various phytoconstituents such as proteins, lipids, carbohydrates and moisture content, ash content as well as crude fibre content of five wild vegetables namely *Cassia tora*

*l., Basella alba l., Hibiscus cannabinus l., Portulaca quadrifida l., Rivea hypocrateriformis Desr.*etc.

These 5 vegetable leaves are neglected or treated as weeds and not commonly used as vegetables. Many deficiency, diseases and poor nutritional diet problems are there in India. By using these leaves as vegetables in diet, health benefits can be harvested up to some extent. Hence, an investigation was undertaken. The main objectives of present work were to estimate different nutritional parameters of 5 wild vegetables. (*Cassia tora L., Basella alba L., Hibiscus cannabinusL., Portulaca quadrifida L., Rivea hypocrateriformis Desr*.) and to popularize wild vegetables.

2. **Materials and Method**

Following 5 wild vegetables were studied in the project.

- *Cassia tora L.*
- *Basella alba L.*
- *Hibiscus cannabinus L.*
- *Portulaca quadrifida L.*
- *Riveahypocrateriformis* Desr.

2.1 Collection of plant material:

We collected *Cassia tora L*. from village Bhokar roadside, *Rivea hypocrateriformis Desr*. from Bhambhori roadside, *Portulaca quadrifida L*. from local market of Jalgaon, *Basella alba L*. from our home garden, *Hibiscus cannabinus L*. from agriculture field in Kanhada Bk.

2.2. Identification & Authentication:

All the plant samples were Identified and Authenticated by Taxonomist Dr. S. A. Chaudhari

2.3. Estimation of Moisture Content; (Banik et al, 2018)

Procedure:

1. 10 gm of the fresh sample of each plant material was taken.
2. Plant material was taken in the crucible.
3. Then crucible was heated at 105˚C until constant weight is attained.
4. The moisture content of each plant material was calculated as a loss in weight of the original sample and expressed as the percentage moisture content.

Calculation: % of moisture content = (fresh weight-dry weight/fresh weight) ×100

2.4. Estimation of ash content: (Banik et al, 2018)

Procedure:

1. 3 gm pulverized dry plant sample was taken.
2. The sample was placed in the crucible and then the crucible was kept in a muffle furnace at 550° C at 6 hours then cooled it.

Calculation:

% of ash content = (Weight of the sample/weight of the sample taken) ×100

2.5. Estimation of crude fibre: (Khandelwal and Sethi, 2014)

Chemicals:

- 10%v/v nitric acid (HNO_3)
- 2.5%v/v sodium hydroxide(NaOH)

Procedure:

1. 2 gm powder plant material was taken in a beaker.
2. 50 ml of 10% v/v nitric acid was added.
3. Heated to boil with constant stirring (till about 30 sec after boiling starts).
4. Strained through fine cotton cloth in a Buchner funnel.
5. Washing to the residue with boiling water was given (suction may be used).
6. Residue was transferred from the cloth to a beaker.
7. 50 ml of 2.5%v/v sodium hydroxide solution was added.
8. Heated to boil, boiling point for 30 sec was maintained with constant stirring.
9. Strained & washed with hot water.
10. For quantitative determination, the residue was transferred in a cleaned dried crucible.
11. The residue was weighed, and percentage fibre content was determined.

Calculation:

% of crude fibre = Total crude fibre content /Weight of plant material ×100

2.6. Estimation of protein: **(Jayaraman, 1994 and Sawhney and Singh, 2011)**

Chemicals

- Solution A: 2% sodium Carbonate- weighed 2 gram of sodium carbonate and it was dissolved in 100 ml 0.1 N NaoH
- Solution B: 0.5% Copper sulphate ($CuSO_4.5H_2O$) weighed 0.5 gm of copper sulphate and it was dissolved in 100ml 10% Sodium potassium tartrate (freshly prepared)
- Solution C: 50 ml of solution A mixed with 1ml of solution B, just prior to use
- Folin-Ciocalteau reagent: FCR was diluted with equal volume of water just prior to use.
- Protein solution (stock standard): weighed accurately 50mg of Bovine Serum Albumin (BSA) and dissolve in distilled water and make up volume to 50 ml in volumetric flask.
- Working Standard: Dilute 10 ml of the stock solution to 100 ml with distilled water.1 ml of this solution contains 100 µg protein.
- Preparation of Protein sample: Sample extract: 1g sample was taken. The sample in pestle mortar in 5 ml of phosphate buffer was macerated and the material was transferred to centrifuge tubes. The homogenate was centrifuged at 8000 rpm for 20 min. The supernatant was collected and was repeated 4-5 times. The supernatants and were combined the volume were adjusted to 50 ml with phosphate buffer.

Procedure:

1. 0.2, 0.4, 0.6, 0.8 and 1 ml of the working standard were pipetted out into series of test tubes
2. 0.1 and 0.2ml of the samples extract were pipetted out in other 2 test tubes.
3. Volume was adjusted to 1 ml in all test tubes. A tube with 1 ml of water served as blank.
4. 5 ml of solution C was added mixed well and incubated at room temperature for 10 min.
5. 0.5 ml of FCR was added, mixed well immediately and incubated at room temperature in the dark for 30 minutes.
6. The reading was taken at 660 nm.
7. A standard graph was drawn and the amount of protein in the sample was calculated.
8. The amount of protein can also be calculated as follows.

Concentration of unknown sample = O.D of unknown /O. D of standard × concentration of standard.

2.7. Estimation of total lipids: (Jayaraman 1994)

Procedure:

1. In this method, a mixture of chloroform and methanol (2:1v/v) is used.
2. 1gm of fresh plant material was taken and then grinded in a mortar & pestle with about 10ml distilled water.
3. The pulp transferred to a conical flask (250ml) capacity and 30ml of chloroform methanol mixture is added and mixed well.
4. For complete extraction it is advisable to keep this overnight at room temperature preferably in the dark.
5. Then at the end of this period, a further addition of 20 ml chloroform and 20 ml water was made.
6. The resulting solution to centrifugation when generally 3 layers are seen. A clear lower layer of chloroform containing all the lipids, a colored aqueous layer of methanol with all water-soluble material and a thick pasty interface are seen.
7. The methanol layer is discarded, and the lower layer is collected.
8. The organic layer is taken in a pre-weighed beaker.
9. It was kept in warm water (around 50˚)
10. Keep the sample covered with a dark paper to protect from light.
11. When the solution is free of organic solvents the weight is determined again.
12. The difference in weight gives the weight of the lipids.

Calculation:

% of lipid = Total weight of lipid content/weight of plant material ×100

2.8. Estimation of total carbohydrates: (Sadasivam and Manickam, 2009)

Chemicals:

- 2.5N HCl (purity 35%), Anthrone reagent,95% H_2SO_4, Na_2Co_3, Standard glucose, Toluene, Distilled water
- Antrone reagent: 200mg anthrone in 100ml of ice cold 95% sulphuric acid.
- Standard glucose: Stock: 100 mg glucose in100ml Distilled water.
- Working Standard: 10 ml stock solution in 100ml of distilled water.

Procedure:

1. 100mg of sample was taken into a boiling tube.
2. The material was hydrolyzed by keeping it in a boiling water bath for 3 hours with 5 ml of 2.5 N HCl and cool to room temperature.
3. It was neutralized it with solid sodium carbonate until the effervesces ceases.
4. The volume was made to 100 ml and centrifuged.
5. The supernatant was collected and 0.5 and 1 nml aliquots were taken for analysis.
6. The standard was prepared by taking 0, 0.2 0.4, 0.6, 0.8 and 1ml of the working standard '0' serves as blank.
7. The volume to 1 ml was made in all test tubes including the sample tubes by adding distilled water.
8. Then 4 ml of anthrone reagent was added.
9. Heated for 8 minutes in a boiling water bath.
10. Cooled rapidly and read the green to dark green color at 630 nm.
11. A standard graph was drawn by plotting concentration of the standard on the X-axis.
12. From the graph the amount of carbohydrates present in the sample tube was calculated.
13. The amount of carbohydrates can also be calculated by using following formula.

Amount of carbohydrates present in 100mg of the sample = mg of glucose/volume of test sample ×100.

Photo plates:

Fig 1: *Cassia tora L.*

Fig 2: *Basella alba L.*

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Fig 3: *Hibiscus cannabinus L.*

Fig 4: *Portulaca quadrifida L.*

Fig 5: *Rive ahypocrateriformis Desr.*

3. Result and Discussion

Theobserved result shows the presence of moisture content, Ash content, Crude fibre, Lipid, Carbohydrate estimate in the 5 wild vegetables are as given in the following table:

Name of vegetables	Moisture content %	Ash content %	Crude Fibre %	Protein per gram (mg)	Lipid per gram (mg)	Carbohydratesper gram (mg)
Cassia tora L.	85.80	**5.3**	12.75	**1.67**	40	320
Basella alba L.	**92.89**	2.06	10.45	0.93	76	120
Hibiscus cannabinus L.	88.76	1.7	**32.85**	1.8	**94**	136
Portulaca quadrifida L.	90.86	2.6	28.25	1.66	74	120
Riveahypocrateriformis Desr.	82.94	5.03	24.45	1.08	10	526

3.1 Discussion

3.1.1 Moisture content

Moisture content is maximum in *Cassia tora L.* and minimum in *Riveahypocrateriformis Desr.* The order of moisture content in the investigated vegetables is as follows:

Basella alba >Portulaca quadrifida>Hibiscus cannabinus >Cassia tora>Rivea hypocrateriformis

Our result of *Cassia toraL.*of moisture content 85.80%. is different from Shaikh & Syed (2015) who recorded 58% moisture continent in *Cassia toraL.*Our result of moisture content of *Basella alba L.* is 92.89%which is somewhat different form moisture content of Deshmuakh and Gaikwad (2014) who recorded 93% the value of moisture content in *Basella alba L.* Our result of moisture content of *Portulaca quadrifida* is 90.86% which is different from of Mulla & Swamy (2010) who reported the 8.75% moisture content level in *Portulaca quadrifida L.* As per our result the moisture content of *Rivea hypocrateri formis Desr.* is 82.94% whereas according to Siddiqui et.al (2021), the value of moisture content in *Rivea hypocrateriformis Desr.*is 6.25%.

3.1.2 Ash content

The ash content level is high in *Cassia tora L.* and minimum in the *Hibiscus cannabinus L.* The sequence of ash content is as follows:

Cassia tora>Rivea hypocrateriformis> Hibiscus cannabinus > Portulaca quadrifida>Basella alba > Hibiscus cannabinus.

Our results of Ash content of *Cassia tora L*is 5.3% which is different from Shaikh and Syed 2015. who recorded 4% value ofAsh content of *Cassia toraL.*As per our result the Ash content of *Basella alba L.*is 2.06% whereas according to Churasiya et.al (2021) the ash content of *Basella alba L.* is 15.9 gm. per 100mg. According to our result of *Hibiscus canabinusL.*ash contents 1.7% and it is different from Ayadi et.al (2016) who reported the ash content level is 4% of *Hibiscus canabinusL.*Our result of ash content in *Portulaca quadrifida L.* is 2.6% and it is different from Mulla & Swamy (2010) who reported the 9.76% ash content level in *Portulaca quadrifida L.*

3.1.3 Crude fiber

The crude fibre is maximum in *Hibiscus cannabinus l* and minimum in *Basella alba l*

The order of crude fibre in vegetables is as follows.

Hibiscus cannabinus > Portulaca quadrifida > Riveahypocrateriformis > Cassia tora.> Basella alba.

According to our result *Cassia tora L.* contain 12.75 %. crude fibre which is different from Kamble & Dhage (2019) who recorded the 27.4%value of crude fibre in *Cassia tora L.* As per our results the crude fibre level in *Basella alba L.* is 10.45%. Whereas according to Chaurasiya et.al. (2021) the crude fibre level in *Basella alba L.* is 1.5%.According to our investigation crude fibre content of *Hibiscus Canabinus L.* is 32.85% which is different from Sultan &Salih (2022) who recorded is 20.25%. of crude fibrein *Hibiscus Canabinus L.* According to our investigation crude fibre content of *Portulaca quadrifida L. i*s 28.25% which is different from Mulla and Swamy (2010) who recorded is 32% crude fibrein *Portulacaquadrifida L.*

3.1.3 Protein

Protein is minimum in *Basella alba l.* and maximum in *Hibiscus cannabinus* L.

The order of protein in the investigated vegetables is as follows:

Hibiscus cannabinus > Cassia tora > Portulaca quadrifida>Riveahypocrateriformis>Basella alba.

Our result of *Cassia tora L.* of protein is 1.67 mg /g. which us different from Kamble & Dhage (2019) who recorded the 12.51% value of protein in *Cassia toraL.*Our results of *Basella alba L.* of protein are 0.93 mg/100g which is different from Chaurasiya et.al. (2021)

who recorded the value of protein 1.8gm per 100gm. Our result of protein of *Hibiscus canabinus L. is* 1.8 mg/g which is different from Sultan & Salih (2022) who reported the 17.23%. of protein in *Hibiscus canabinus L.* As per our investigation the protein in *Rivea hypocrateriformis Desr. is* 1.08mg/g which is different from Siddiqui et.al (2021) who reported the 19.27%. level of protein in *Rivea hypocrateriformis Desr.*

3.1.4 Lipids

The lipids nutritive level is maximum in *Hibiscus cannabinus L.* and minimum in *Rivea hypocrateriformis Desr.*

The order of lipids in vegetables is as follows:

Hibiscus cannabinus > Basella alba > Portulaca quadrifida> Cassia tora>Rivea hypocrateriformis.

As per our result the lipids of *Cassia tora L.*is 40mg/g whereas Kamble & Dhage (2019) reported the 2% level of lipid in *Cassia tora L.* According to our result *Basella alba L.* contains 76 mg/g lipids which is different from Churasiya et.al. (2021) who recorded the value of lipids in *Basella alba L.* is 3.1 gm/100gm. Our results of *Hibiscus canabinus L.* of lipids are 94mg/g which is different from of Sultan and Salih (2022) who recorded 7.15%. of lipids in *Hibiscus canabinus L.*Our result of *Rivea hypoerateriformis Desr.* of lipidsis 10mg/g which is different from Siddiqui et.al (2021) who recorded the2.66% value of lipids in *Rivea hypoerateriformis* Desr.

3.1.5 Carbohydrates

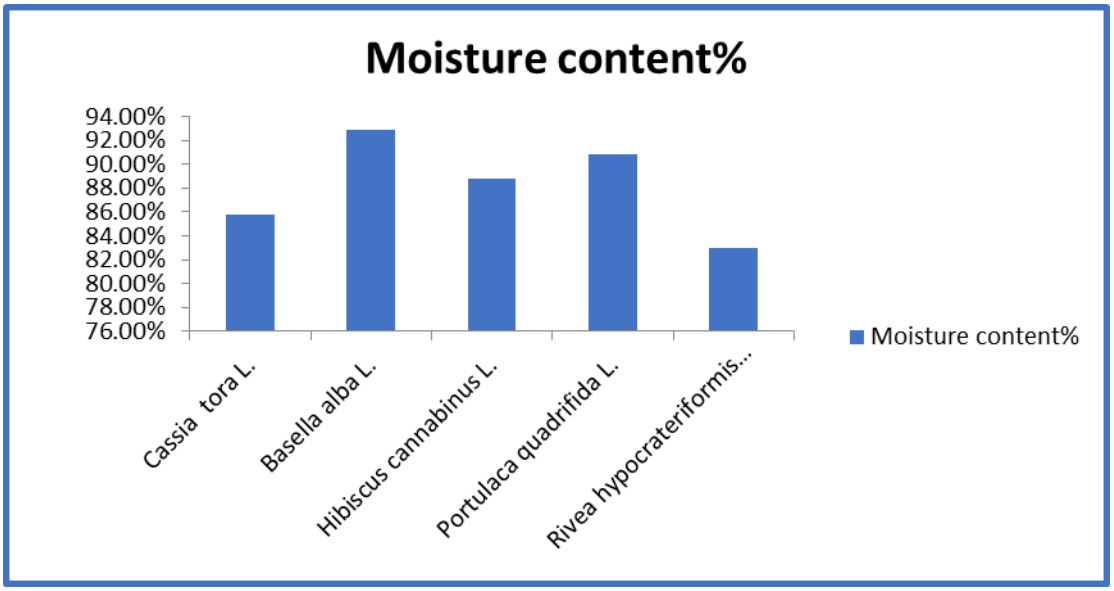
Maximum carbohydrates are in *Rivea hypocrateriformis* and minimum in *Basellla alba* and *Portulaca quadreifida*. Both these plants have same amount of protein.

Rivea hypocrateriformis> Cassia tora>Hibiscus cannabinus >Basella alba =Portulaca quadreifida.

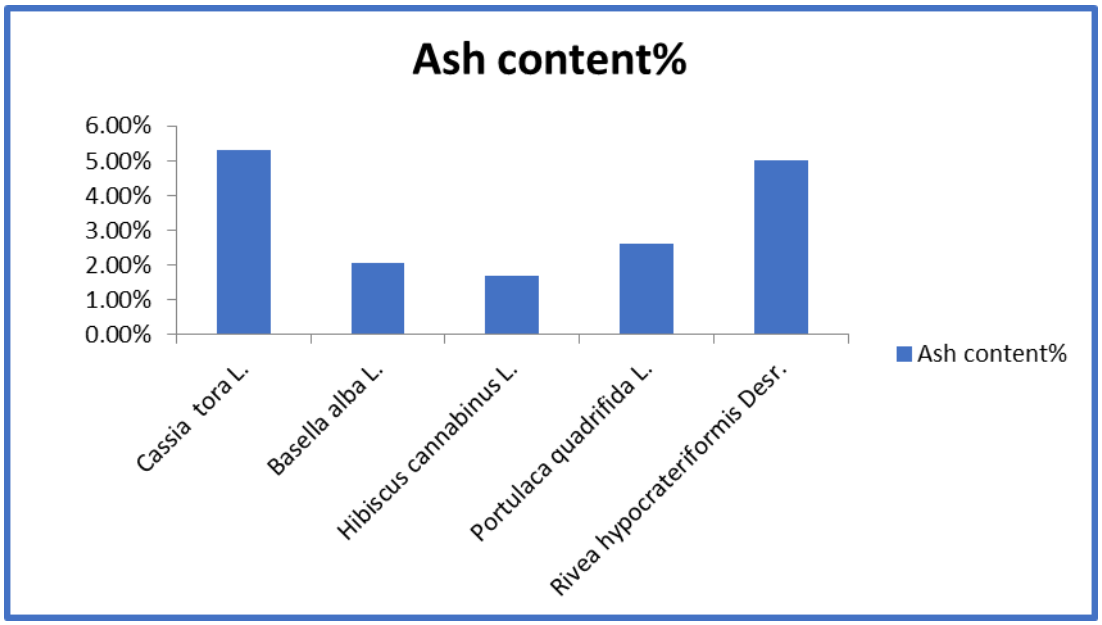
Our result of carbohydrates of *Cassia tora L.* is 320 mg/g which is different from Kamble&Dhage (2019) who recorded the36.60 % value of carbohydrates in *Cassia tora L.* Our result of carbohydrates of *Basella alba L.* is 120 mg/g. which is different from Churasiya et.al (2021).who reported the level of carbohydrates in *Basella alba L.* is 42gm/ 100gm.As per our investigation the carbohydrates level in *Hibiscus canabinus L.* is 136 mg/g. whereas according to Sultan & Salih (2022) the carbohydrates level of *Hibiscus canabinus L* .is 40.76%.As per our investigation the carbohydrates level in *Rivea hypoerateriformis* is

526mg/g whereas according to Siddiqui et.al (2021) the carbohydrates level is 57.63%. of *Rivea hypoerateriformis Desr.*

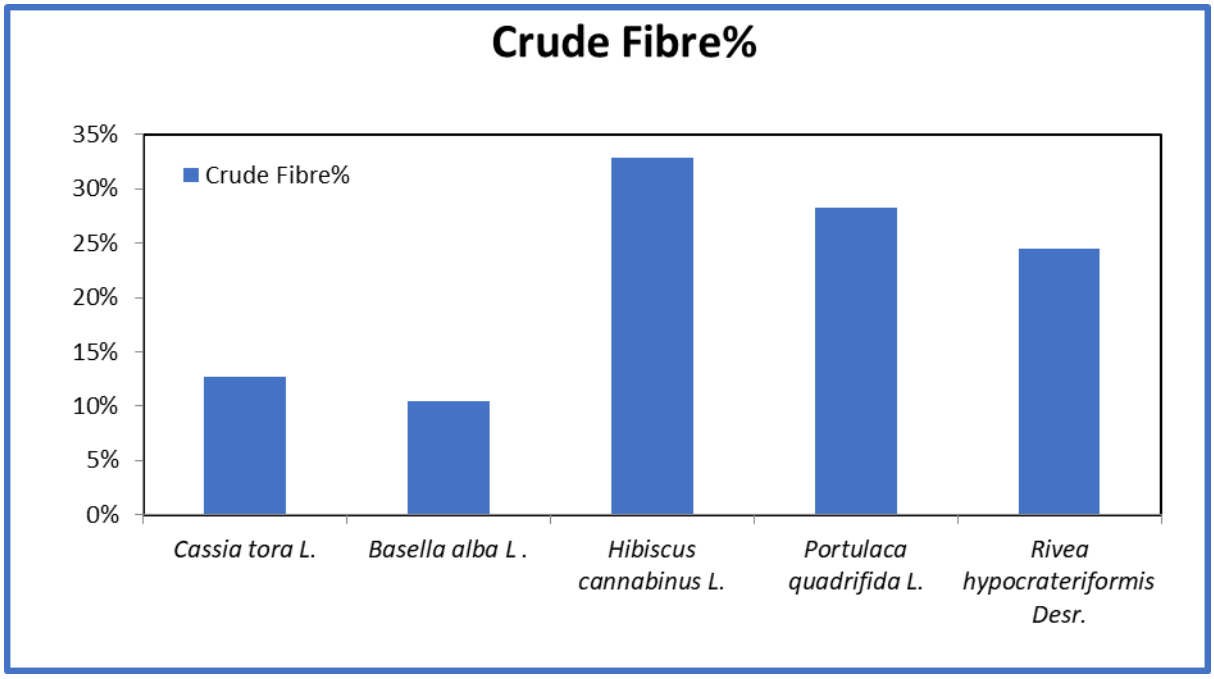
Graphs



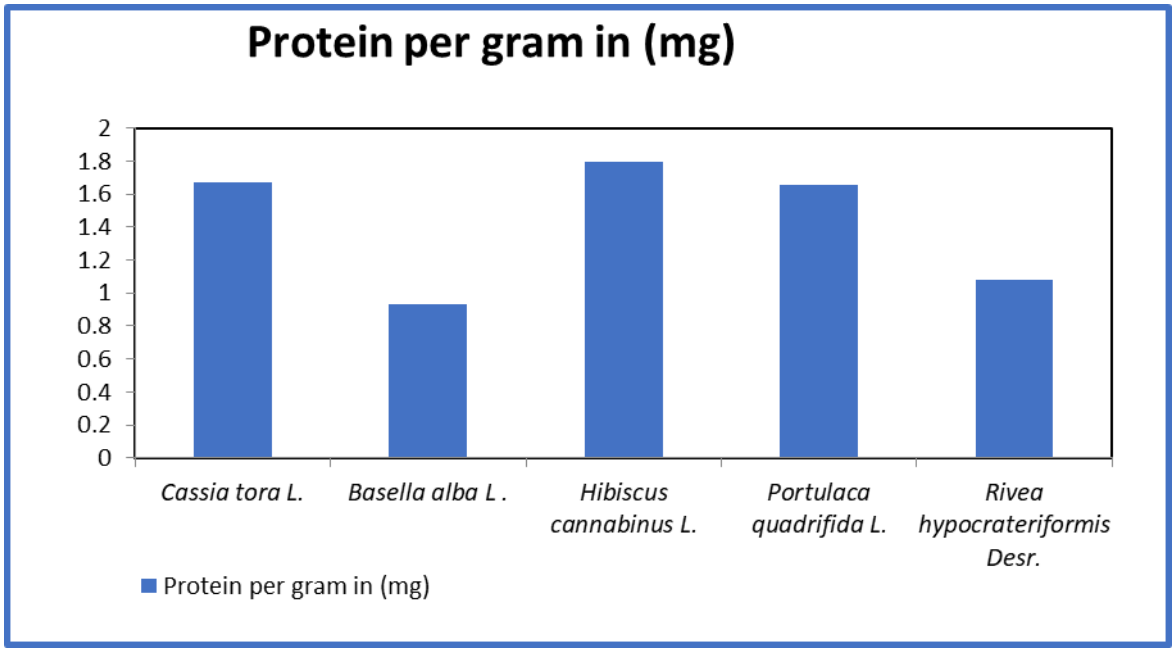
Graph 1: Moisture content in wild vegetables



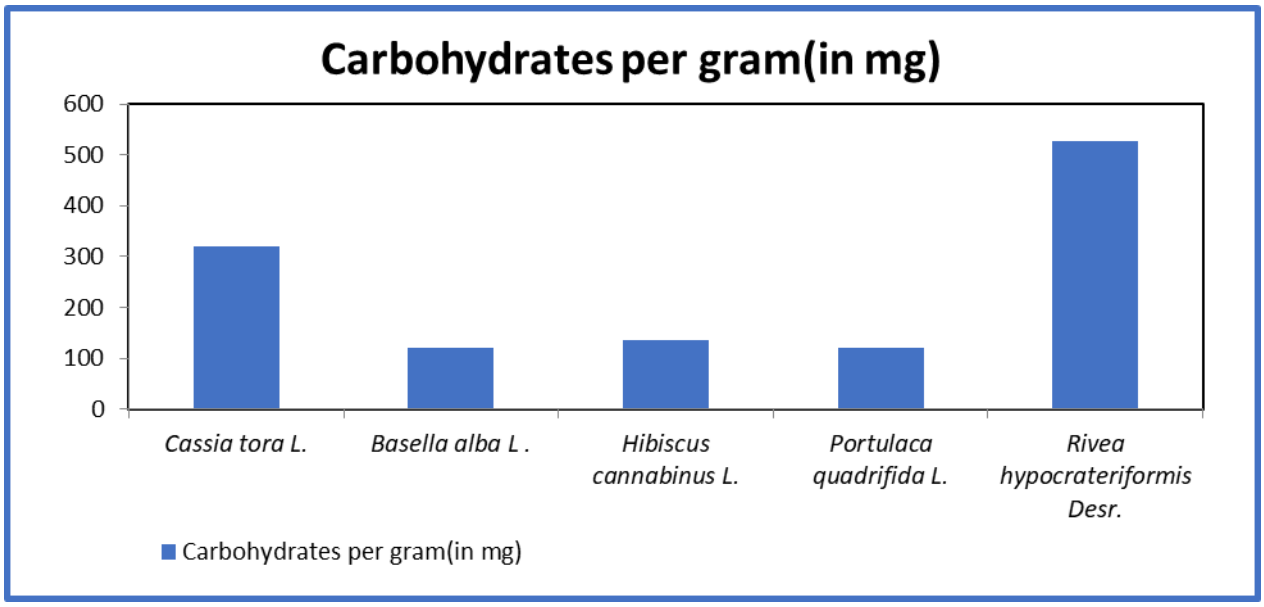
Graph 2: Ash content in wild vegetables



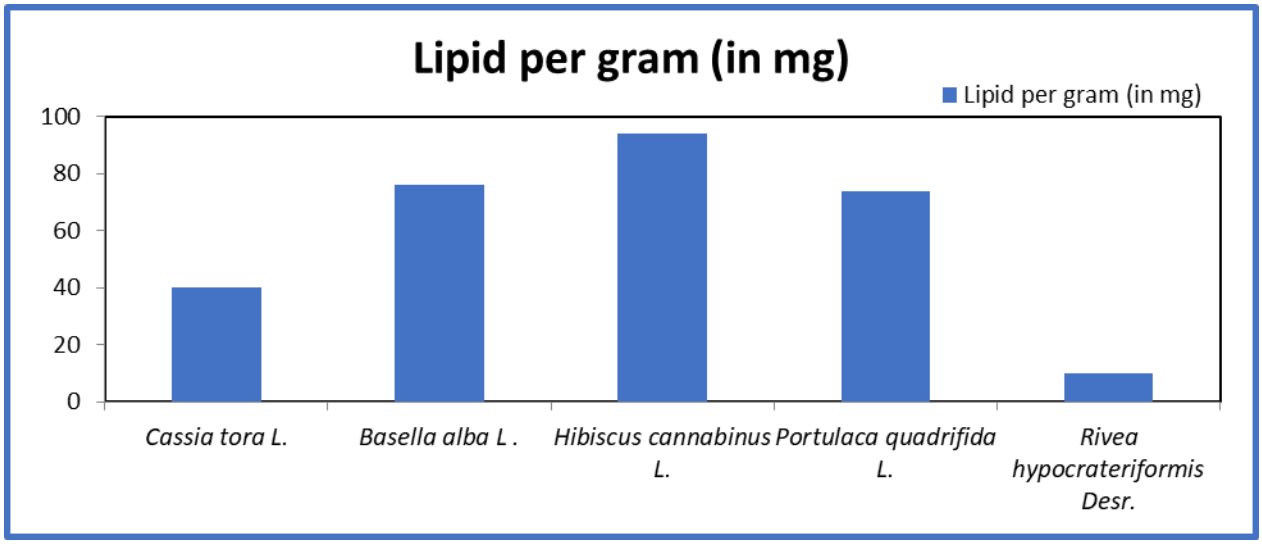
Graph 3: Crude fibre in wild vegetables



Graph 4: Protein contain in wild vegetables.



Graph 5: Carbohydrates in wild vegetables



Graph 6: Lipid in wild vegetables.

Conclusion

Based on present research work we can conclude that all the 5 investigated wild vegetables have good amount of nutrients (proteins, lipids, carbohydrates). All these vegetables also have good percentage of crude fibres which are useful for digestion because they show laxative property. Hence, use of wild vegetables in our daily diet as much as possible is essential to make our life healthier. Nowadays such research must be promoted as

wild vegetables are super for better health. Review of literature showed that all these vegetables also have good medicinal potential. Hence, they can be used as nutraceuticals.

Acknowledgement

The authors would like to express gratitude to esteemed Principal of Dr. Annasaheb G. D. Bendale Mahila Mahavidyalaya, Jalgaon for the guidance and continuous support throughout this Budding Research project.

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