



Phytochemical analysis of selective millets

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Abstract:

Millets are a group of small seeded grasses are probably grown around the world. They belong to grass family and are cultivated majorly in developing countries of Asia and Africa. They are considered to be 'super foods' which are healthier option for stable diet rather than rice and wheat.

In the present phytochemical analysis of some dietary useful millets i.e. Finger millets, Flax Seed, *Panicum miliacium*, *Macrotyloma uniflorum*, shows various bioactive components which are very useful in human health profile. Presence of flavonoids, phenol, steroid, glycosides, saponin, tannin, Terpenoids shows strong antioxidant properties due to high phenol content in it.

Key word: Millet, phytochemical, Human Health, antioxidant etc.

Introduction:

Millets are a group of small seeded grasses are probably grown around the world. They belong to grass family and are cultivated majorly in developing countries of Asia and Africa. They are considered to be super foods which are healthier option for stable diet rather than rice and wheat. Not just nutritional value, growing millets in a crop is also eco-friendly. It can grow in drought condition as well as very few or no fertilizers at all. India was largest, millets producing millet nutritionally millets gives a lot of energy which is 378 kcal per 100gm of serving with carbohydrate (72.89, dietary fiber (8.59), fat (4:39). It also contain a lots of other proteins, vitamins and minerals

In developing countries like India and other Asian country, Proso millet (*Panicum miliaceum L.*) is an important cereal and a valuable component of the human diet. The Proso millet shows wide range of tolerance and can be cultivated in all types of weather.¹ The Proso millet having good quality starch² and crude protein contents.³ Epidemiological studies show that increased consumption of proso millet and its products are associated with reduced risk of chronic diseases, such as elevated serum cholesterol⁴, cardiovascular disease⁵, type II diabetes⁶, and liver injury⁷. These health benefits have been attributed in part to its unique photochemical profile. However, chemistry and biological

activities, including antioxidative and anti-proliferative effects of proso millet grains have not received as much attention as phytochemicals in fruits and vegetables. Therefore, the phytochemicals contents of edible proso millet need closer examination due to their potential health benefit in the prevention of chronic diseases.

Chandrasekara and Shahidi⁸ reported the phenolics in millet whole grain samples, including one proso millet sample. However, millets belong to a range of different species of family *Gramineae*. Proso millet belongs to *Panicum* genus, which possesses a different phytochemical profile to those other genera in *Gramineae*.

Finger millet (*Eleusine coracana L.*) is important millet grown extensively in various regions of India and Africa, constitutes as a staple food for a large segment of the population in these countries. It ranks sixth in production after wheat, rice, maize, sorghum and bajra in India. The acidic methanol extracts from the seed coat showed high antibacterial and antifungal activity.⁹ They are high fiber and nutritious food which full of good carbohydrates and iron. It improves hemoglobin count. It can slow down the process of aging. It also helps in weight loss and food intolerances.

Flax seed provided healthful fat, antioxidant and fiber so it is also called 'functional food' which boosts health of persons. Soaked flax seeds are rich in fiber and consist of natural laxatives therefore it has benefits to cure constipation. One can use roasted flax seed powder to soak it in water for overnight. Flax seeds benefit females by maintaining the normal length between the ovulation and menstruation. It also helps females in fertility by increasing the chances of conception. It also helps to maintain the hormonal balance. Also benefits include that of weight loss. They are a high source of omega fats and fiber due to which they give you satiety value. To get the proper absorption of nutrients it's better to have flaxseeds powder should be consumed. Even flax seeds oil can be consumed for optimal benefits.¹⁰

Proso millet (*Panicum miliaceum*) is a small crop with many common names in different regions including proso millet, common millet, broomcorn millet, kashfi millet, hog millet, white millet, and red millet. Proso millet contains fat (4%), carbohydrates (70%), high amount of protein compared to other grains (10-12%) and significantly richer in essential amino acids. This is a gluten free grain and therefore it is suitable for people with coeliac disease and other gluten intolerances. It is an effective alternative for wheat and wheat products. It also contains oleic acid, linoleic acid, stearic acid and essential minerals like phosphorus, manganese, calcium and magnesium and rich in B-complex vitamins. Proso millet is rich in phytochemicals including phytic acid, which is believed to lower cholesterol, and phytate, which is associated with reducing cancer risks, along with phenolic acids and benzoic acids.¹¹

Horse gram (*Macrotyloma uniflorum (Lam.) Verdcourt (Syn., Dolichos uniflorus Lam., Dolichos biflorus auct. non L.)*) belonging to Fabaceae, is protein-rich and is amenable for cultivation in dry conditions and marginal soil fertility. Flowers together in the leaf axils without a common peduncle. Seeds of horse gram are ovoid in shape and colored pale fawn, light red, brown, or black; reddish brown or grey; pale brown, medium brown and blackish brown. In ayurvedic medicine, whole

seeds of horse gram, is advocated in the treatment of renal stones, piles, edema, etc.. The seeds have been reported to be a significant source of iron, molybdenum and protein.¹²

Material and Method

Study Area:

Vaijapur has a semi-arid climate prevailing. It is warm to hot all year round. The average annual temperature of Vaijapur is 33 °C and there is about 248mm rain in a year. It is dry for 288 days with an average humidity of 42% and an UV index 7 on an average in Vaijapur. Its maximum temperature is 28 °C and it is at least around 16 °C in January. Its maximum temperature is 32°C and it is at least 19 °C in February. In total 4 species named as finger millet, flax seed, panicum miliceum, macrotyloma uniflorum were assembled used for study.

Preparation method of sample:

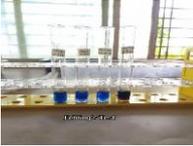
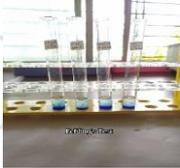
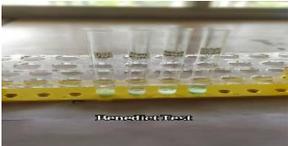
Sample grains were collected and washed thoroughly with running tap water to remove dust particles. Then they were dried at room temperature. All dry samples were ground respectively to fine powder. Two types of sample solvents were used for preparation of extract i.e. Aqueous and 70% Ethanol solvents. Two flasks were used for finger millet (S1), out of which one was used for aqueous and another was used for Ethanol.

1. In Aqueous solvent; add 50ml of distilled water and 5 gram powder sample of finger millet.
2. In 70% Ethanol solvent; add 50ml of distilled water and 5 gram powder sample of finger millet.

Same procedure used for another three samples of each Flax Seed (S2), Panicum Miliaceum (S3), Macrotyloma Uniflorum (S4). After addition they were kept for 24 hours then they were filtered with help of filter paper. Later all filtrate were used for qualitative test.



Qualitative test:**Test for Carbohydrates**

TEST	OBSERVATION	RESULTS
<p>Fehlings solution Test for carbohydrates :- 2ml of extract was added in each test tube and heated gently then 1 ml of Fehling solution A & 1ml of Fehling solution B were added. Then the brick red precipitate appeared at the bottom of the test tube. It indicates the presence of carbohydrates.</p>	<p>Test for carbohydrates Aqueous Extract The brick red precipitate was formed in <i>Macrotyloma uniflorum</i>.</p>  <p>Test for carbohydrates Ethanolic Extract The brick red precipitate does not form in all millets.</p> 	<p>It indicates the presence of carbohydrates</p>
<p>Benedict's Test for carbohydrates: - 2ml of extract was added in each test tube & heated gently then few drops of Benedict's reagent was added subsequently a reddish brown PPT is formed</p>	<p>Test for carbohydrates Aqueous Extract The reddish brown colour not form in all millets</p>  <p>Test for carbohydrates Ethanolic Extract The reddish brown colour was not form in all solution</p> 	<p>It indicates the presence of carbohydrates.</p>

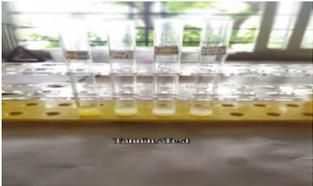
<p>Naphthol Solution Test - 1ml of extract were added in each test tube then 0.5 ml Naphthol solution was added in each test tube. Then 2ml of concentrated H₂SO₄ was also added the red violet ring at the junction of solution, shows then 2 % NaoH alkaline solution added, the colour disappear shows present of carbohydrates</p>	<p>Test for carbohydrates Aqueous Extract The colour is disappearing in flax seed and <i>Macrotyloma uniflorum</i></p>  <p>Test for carbohydrates Ethanolic Extract The colour disappear is form in finger millets and Flax seed.</p> 	<p>It indicates the presence of carbohydrates.</p>
<p>Molish-Test: 2ml of extract was added in each test tube then 2 drops of alcoholic alpha Naphthol is added then 1ml of concentrated H₂SO₄ is added along the side of test tube sequentially formation of violet colour ring indicates the presence of carbohydrates.</p>	<p>Test for carbohydrates Aqueous Extract The violet ring is formed in finger millet, <i>Panicum miliaceum</i> and <i>Macrotyloma uniflorum</i>.</p>  <p>Test for carbohydrates Ethanolic Extract The violet ring do not form in all millets..</p> 	<p>It indicates the presence of carbohydrates.</p>

Test of Proteins

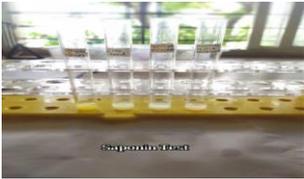
TEST	OBSERVATION	RESULTS
<p>Ninhydrin Test: 2ml of extract was added in each test tube & heated gently with 2ml of 0.2% solution of ninhydrin violet colour appear suggested the presence of amino acids & proteins.</p>	<p>Test for protein Aqueous Extract Violet colour is appearing in <i>Flax seed</i> and <i>Macrotyloma uniflorum</i>.</p>  <p>Test for protein ethanolic Extract Violet color is appearing in <i>Flax seed</i> and <i>Macrotyloma uniflorum</i>.</p> 	<p>It indicates the presence of Proteins and Amino Acids.</p>
<p>Xanthoprotic Test 2ml of extract was added in each test tube the few drop of concentrated HNO₃ was added. Yellow colour appears indicates the presence of proteins and amino acids.</p>	<p>Test for Protein Aqueous Extract The yellow colour is appearing in Finger millet, <i>Flax seed</i> and <i>Macrotyloma Uniflorum</i>.</p>  <p>Test for Protein Ethanolic Extract The yellow colour is appearing in finger millets, <i>Flax seed</i> and <i>Macrotyloma Uniflorum</i>.</p> 	<p>It indicates the presence of Proteins and Amino Acid.</p>

Test of Tannins

Lead acetate test

TEST	OBSERVATION	RESULTS
2ml of extract was added in each test tube then few drops of 1% solution of lead acetate were yellow or red colour occurred it indicate that the presence of tannin .	<p>Test for Tannin Aqueous Extract The yellow or red colour occurred in finger millet.</p>  <p>Test for Tannins Ethanolic Extract The yellow or red colour occurred in flax seed.</p> 	It indicates the presence of Tannins.

Test Of Saponin

TEST	OBSERVATION	RESULTS
Test Of Saponin: 2ml of extract was added in each test tube and then few drops of sodium bicarbonate were add and Shake for 3min. Formation of honey comb like it indicates the presence of saponin.	<p>Test for Saponin Aqueous Extract: Formation of honey comb in finger millets.</p>  <p>Test for Saponin Ethanolic Extract Formation of honey comb in <i>Finger Millet, Flax Seed and Macrotyloma Uniflorum</i></p> 	It indicates the presence of Saponin.

TEST	OBSERVATION	RESULTS
<p>Test for Glycoside:</p> <p>2ml of extract was added in each test tube and 1ml of water is also added then aqueous solution sodium hydroxide was added Then formation of yellow colour shows the presence of glycoside</p>	<p>Test for Glycoside Aqueous Extract</p> <p>The yellow colour is form in finger millet.</p>  <p>Test for Glycoside Aqueous Extract</p> <p>The yellow colour does not form in all millets.</p> 	<p>It indicates the presence of Glycosides.</p>
<p>Killer Killani Test: 2ml of extract was added in each test tube 1.5ml glacial acetic acid was added in each test tube then one drop of 5% ferric chloride was also added then concentrated H₂SO₄ added along the test a brown colored solution shows presence of glycosides.</p>	<p>Test for Glycoside Aqueous Extract</p> <p>The brown colour is form in Flax seed and Macrotyloma uniflorum.</p>  <p>Test for Glycoside Ethanolic Extract</p> <p>Brown colour shows in flax seed and Macrotyloma uniflorum.</p> 	<p>It indicates the presence of Phenol.</p>

Detection of Phenolic Compound

TEST	OBSERVATION	RESULTS
<p>Gelatin Test: Extract was dissolving in 5ml of distilled water added in each test tub tube. Then 1 % gelatin solution and 10% NaCl was added in each test tube. A white precipitate shows presence of phenol.</p>	<p>Test for Gelatin Aqueous Extract White precipitate is form in <i>Finger millet</i> and <i>Panicum milicium</i>.</p>  <p>Test for Gelatin Ethanolic Extract White precipitate does not form in all millets.</p> 	<p>It indicates the presence of Phenol.</p>
<p>Potassium Dichromate Test: 1 ml of extract was added in each test tube .3 drops of potassium dichromate was added decolourization indicates the presence of Phenol.</p>	<p>Test for Potassium Dichromate Aqueous Extract: Decolourization shows in <i>Macrotyloma uniflorum</i>.</p>  <p>Test for Potassium Dichromate Ethanolic Extract Decolourization shows in <i>Flax seed</i> and <i>Macrotyloma uniflorum</i>.</p> 	<p>It indicates the presence of Phenol.</p>

Detection of steroids

TEST	OBSERVATION	RESULTS
<p>Test for Steroids: 1 ml of extract was added in each test tube 2 ml of chloroform and 5 drops of concentrated H₂SO₄ was added side was. Red colour produced in the lower chloroform layer indicate the presence of steroid.</p>	<p>Test for Steroids Aqueous Extract</p> <p>The red colour produced lower chloroform layer in flax seed.</p>  <p>Test for Steroids Ethanolic Extract</p> <p>The red colour produced lower chloroform layer in finger millet and <i>Macrotyloma uniflorum</i>.</p> 	<p>It indicates the presence of Steroids.</p>

Detection of Flavonoids

TEST	OBSERVATION	RESULTS
<p>Alkaline Reagent Test: 1 ml of extract was added in each test tube then 10% of Ammonium hydroxide solution was added in each test tube .yellow fluorescent shows positive test.</p>	<p>Test for Flavonoids Aqueous Extract</p> <p>Yellow fluorescent shows in <i>Finger millet</i>, <i>Panicum milicium</i> and <i>Macrotyloma uniflorum</i>.</p>  <p>Test for Flavonoids Ethanolic Extract</p> <p>Yellow fluorescent do not show in both solution.</p>	<p>It indicates the presence of Flavonoids.</p>



Detection of drugs [Quinine] -

TEST	OBSERVATION	RESULTS
<p>1 ml extract was added in test tube, and then few drops of conc.H₂SO₄ were added. Yellowish brown colour indicates the presence of drugs.</p>	<p>Test for Quinine Aqueous Extract The reddish brown colour shows in <i>Macrotyloma uniflorum</i>.</p>  <p>Test for Quinine Ethanolic Extract Yellowish brown colour present in <i>Finger millet</i> and <i>Macrotyloma uniflorum</i>.</p> 	<p>It indicates the presence of Quinine.</p>

Detection of Terpenoids

TEST	OBSERVATION	RESULTS
<p>1 ml extract was added in test tube, and then 1 ml of chloroform dissolved and evaporated and dried. To this test tube 2ml of concentrated H₂SO₄ added and heated for about 2 minutes. Formation of a reddish brown colour indicates presence of Terpenoids.</p>	<p>Test for Terpenoids Aqueous Extract</p> <p>The reddish brown colour does not form in all millets.</p>  <p>Test for Terpenoids Ethanollic Extract</p> <p>The reddish brown colour shows in <i>Macrotyloma uniflorum</i>.</p> 	<p>It indicates the presence of Terpenoids.</p>

Detection of Carboxylic acid-

TEST	OBSERVATION	RESULTS
<p>Test for Carboxylic Acid: 2 ml of extract was added in each test tube .Then 1 ml of sodium bicarbonate solution was added in each test tube. Appearance of effervescence shows positive test.</p>	<p>Test for Carboxylic Acid Aqueous Extract The appearance of effervescence shows in <i>Finger millet, Flax seed, Panicum milicium,</i> and <i>Macrotyloma uniflorum.</i></p>  <p>Test for Carboxylic Acid Ethanolic Extract The appearance of effervescence shows in <i>Flax seed, Panicum milicium</i> and <i>Macrotyloma uniflorum.</i></p> 	<p>It indicates the presence of Carboxylic Acid.</p>
<p>Braymer's test for Carboxylic Acid: 1 ml filtrate was added in each test tube then 3 ml distilled water was added after that 3 drops of 10% ferric chloride solution added subsequently. Formation of Blue green colour indicates the presence of Carboxylic Acid.</p>	<p>Test for Carboxylic Acid Aqueous Extract Blue green colour does not form in all millets</p>  <p>Test for Carboxylic Acid Ethanolic Extract Blue green colour form in flax seed and <i>Macrotyloma uniflorum.</i></p> 	<p>It indicates the presence of Carboxylic Acid.</p>

Qualitative Analysis

[FE- Fehlings, BE- Benedicts, NP- Napthalin, ML- Molish, NH- Nin-hydrin, XN- Xanthoprotic, GL- Glycosides, KK- Killer-Killani, GT- Gelatin, AK- Alkaline

PDT: Potassium Dichromate test]

Sr n o	Millets name	Solvent	Test for carbohydrates				Test for Protein		Test for tannin LA	Test for saponi n +++	Test for glycoside		Test of phenol		Test of steroid	Test for flavonoi d AK	Test for quinine	Test of Terpenoi ds	Test of carboxyli c acid
			FE	BE	NP	ML	NH	XN			GL	KK	GT	PDT					
1	Finger - Millets	Aqueou s	---	---	---	+++	---	---	+++	---	+++	---	+++	---	---	+++	---	---	+++
		70% Ethanol	---	---	+++	---	---	+++	---	+++	---	---	---	+++	---	+++	---	---	---
2	Flax- Seed	Aqueou s	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		70% Ethanol	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3	Panic um Miliac ium	Aqueou s	---	---	---	+++	---	---	---	---	---	---	---	---	---	+++	---	---	+++
		70% Ethanol	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4	Micro tylom a uniflo rum	Aqueou s	---	---	+++	+++	---	---	---	---	---	---	---	---	---	+++	+++	---	+++
		70% Ethanol	---	---	---	---	+++	---	---	---	---	---	---	---	---	+++	+++	+++	+++

Table: Shows preliminary phytochemical analysis of different types of selective millets.

Result and Discussions

The qualitative analysis of all millets shows presence of various components useful for health.

Finger millets: The qualitative analysis of finger millets shows presence of carbohydrate, protein, tannin, saponin, glycoside, phenol, flavonoid, carboxylic acid in aqueous solution. Whereas carbohydrate, protein, saponin, steroid, quinine were found in ethanol solution.

Flax Seed: The qualitative analysis of flax seed shows presence of carbohydrate, protein, glycoside, phenol, steroid, carboxylic acid in aqueous solution. Whereas protein, tannin, saponin, glycoside, phenol, carboxylic acid were found in ethanol solution.

Panicum miliacium: The qualitative analysis of *Panicum miliacium* shows presence of carbohydrate, phenol, flavonoid, carboxylic acid in aqueous solution. Whereas glycoside and carboxylic acid were found in ethanol solution.

Macrotyloma uniflorum: The qualitative analysis of *Macrotyloma uniflorum* shows presence of carbohydrate, protein, glycoside, phenol, flavonoid, carboxylic acid in aqueous solution. Whereas protein, saponin, glycoside, steroid, quinine and carboxylic acid were found in ethanol solution.

Parthvaraj p Sudhakaran Mr. Athinarayan G Narayan KR (2015) also observed phytochemical constituent in grains of *Microtyloma uniflorum* which is carbohydrates, steroid, tannin, protein, amino acids phenolic compound. In our study we observe additional phytochemicals i.e. saponin, glycoside, flavonoid, in qualitative test.¹⁵

Dr. Maria Joseph (2016) was observed the phytochemical constituents in grain of flax seed i.e. saponin quinine, cardiac glycosides, Terpenoids, phenol, coumarins, steroids, alkaloids, betacyclin. In our investigation, all above phytochemicals except betacyclin and coumarins in flax seed are observed. In addition of above carboxylic acid is observed in flax seed.¹³

Busa Niharika, Dipti Sony Saipuriar, Ritika Ranjan, Virendra Vaishnav (2020) observed the phytochemicals in finger millets with the help of qualitative test such as alkaloids, carbohydrates, phenol, tannin, resins. Similar to their study, we observed all above along with quinine, and carboxylic acid.¹⁴

Conclusion

In the present phytochemical analysis of some dietary useful millets i.e. Finger millets, Flax Seed, *Panicum miliacium*, *Macrotyloma uniflorum*, shows various bioactive components which are very useful in human health profile. Presence of flavonoids, phenol, steroid, glycosides, saponin, tannin, Terpenoids shows strong antioxidant properties due to high phenol content in it. The millets are one of the 'super food' because it having high amount of proteins and carbohydrates. Presence of steroid in all selected millets, indicate that, this is useful to increase hemoglobin level in human population.

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