

Study of Phytochemical constituents of *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* plants used by ethnic people of Ranchi district of Jharkhnad.

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Abstract

Medicinal plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. In this research some of the ethnomedicinal plants used to cure anaemia by ethnic people of Ranchi district of Jharkhand have been selected and phytochemical screening of *Beta vulgaris* L., *Amaranthus caudatus* L. and *Brassica oleracea* was performed in four different solvents i.e. Chloroform, ethanol, methanol and distilled water. The tests showed the presence of bioactive compounds such as saponin, flavonoids, tannins, protein, phenolic compounds in most of the samples that make the plant potential source of phytochemicals and hence are used as herbal medicine by local people. More studies are needed for exploring uses of these potential herbs for drug formulation and other curative purposes.

Keywords : Phytochemicals, *A. caudatus*, *B. vulgaris*, *B. oleracea*, herbal medicine

INTRODUCTION

Medicinal plants have been used all over the world as a source of medicine and it has been described in ancient texts such as Bible and Vedas¹. More than 35000 plant species have been used around the world for medicinal purposes².

In India, more than 8000 plant species have been used by people particularly tribal communities in traditional medicine system such as Ayurveda³.

Jharkhand is one of the mineral rich states of India. More than 1500 medicinal plants are found in this state⁴.

Some of the important ethnomedicinal plants used for cure of anaemia and other ailments include *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* etc.

Beta vulgaris L. is a type of plant belonging to family amaranthacea, containing high iron and hence help in overcoming anaemia⁴. It is one of the best source of high level of anti-oxidants^{5,6}. It contains various biologically active phytochemicals such as flavonoids, polyphenols, ascorbic acid and inorganic nitrate^{7,8,9}. Beetroot juice is a healing juice which act as blood building herb which detoxifies blood and helps in regeneration of red blood cells¹⁰.

Amaranthus caudatus L. belonging to amaranthacea family is a fast growing herb mainly cultivated in Asia. The plant is highly nutritious and consumed by every section of society. The leaves are rich in minerals such as calcium, iron, magnesium, phosphorus, potassium, zinc, copper and manganese¹¹. The plant is having various bioactive substances¹².

Brassica oleracea is a plant belonging to family Brassicacea. It is a vegetable originated in Italy and commonly called broccoli. It has high vitamin C and dietary fiber. It contains multiple nutrients. It can be consumed both as fresh and processed food. The pharmacological activities of broccoli includes immune system booster, helps in reducing blood pressure, helps in supporting stomach health, building strong bones etc¹³.

MATERIAL AND METHOD

1. **Survey** – The experimental plants was selected on the basis of ethnomedicinal literatures, field survey and documentation of ethnomedicinal information based on conversation with Pahanas, Vaidyas, faith healers, knowledgeable persons.
2. **Collection of plant material** – The plant materials, *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* was collected from Ranchi district of state Jharkhand, India. The plant materials was collected in plastic zip lock bag and brought to the laboratory of University Department of Botany, Ranchi University, Ranchi.
3. **Identification of plant material** – The plant materials *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* was identified by L. Rasingam, Scientist – ‘E’ & HoO, Botanical Survey of India, Hyderabad, India.

(Identification no.: BSI/DRC/2024-25/Identification/134(*Beta vulgaris* L.)), (Identification no.: BSI/DRC/2024-25/Identification/150(*Amaranthus caudatus* L.)).

4. **Preparation of plant extract** – Fresh leaves of *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* was collected from Ranchi. The leaves were washed with running tap water 2- 3 times to remove impurities. After washing it was again washed with distilled water. The leaf samples was shade dried for around 20 days. The dried leaf samples were grinded through mortar and pestle to make powdered form. 5 gm of powdered plant samples were soaked separately in 50 ml of extraction solution. After mixing the plant sample in different solvent, the solution was shaken and kept in dark for 48 hours. After 48 hours, the sample was filtered through Whatman filter paper in a dried and clean beaker.
5. **Solvents used** – The plant extracts were prepared by using four different organic solvents. The solvents are methanol, ethanol, distilled water and chloroform.
6. **Phytochemical screening** - Phytochemical screening of the plant extracts was performed for the presence of various phytochemicals as per method of Kokate CK et.al. for protein, saponins, alkaloids, flavonoids, tannins, phenol.
 - **Test for protein** – To 3ml of extract , 1 ml of 4% sodium hydroxide and 1ml of 1% copper sulphate were added. The change in colour of the solution to violet indicated the presence of proteins.
 - **Test for saponin** –Foam test – 1ml of extract was shaken with 10 ml of water and observed for persistent foam, which indicated the presence of saponin.
 - **Test for flavonoids** – Ferric chloride test – To 3ml of extract , few drops of ferric chloride solution was added. Development of intense green colour indicated the presence of flavonoids.

Alkaline reagent test – 2ml of extract was treated with few drops of sodium hydroxide solution. Formation of intense yellow colour which become colorless on further addition of dilute acid indicated the presence of flavonoid.

- **Test for tannin**- Ferric chloride test – To 3ml of extract , 3ml of ferric chloride solution was added. The appearance of blue- black colour indicated the presence of tannin.
- **Test for phenol**- To 3ml of various solvent extracts of sample , a few drops of 10% aqueous ferric chloride solution was added. Formation of blue- green colour indicated the presence of phenol.
- **Test for alkaloids** – To 1 ml of extract , a few drops of 2% sulphuric acid were added and then a few drops of Mayer’s reagent . The presence of alkaloid was indicated by obtaining a white precipitate or turbidity.
- **Test for triterpenoids** – Salkowaski test - To 2 ml of extract , few drops of sulphuric acid was added, shaken and allowed to stand. Appearance of greenish blue colour Indicated the presence of triterpenoids.
- **Iron test** - To 5ml of extract add few drops 2% potassium ferrocyanide. Dark blue coloration observed.

RESULT AND DISCUSSION

The phytochemical screening of *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* was performed in four different solvents i.e. Chloroform, ethanol, methanol and distilled water to detect the presence of bioactive compounds. The tests showed the presence of bioactive compounds such as saponin, flavonoids, tannins, protein, phenolic compounds in most of the samples that make the plant potential source of phytochemicals and hence are used as ethnomedicine by local people.

A constant supply of phytochemical containing plants with desirable health benefits beyond basic nutrition is essential in reducing the risk of diseases in humans. The result revealed that *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* leaves extract have a number of chemical constituents, which may be responsible for various biological activities. These important phytochemicals play variety of role such as anti-oxidants, inhibitor of tumor growth, enzyme modulators, chemical inactivators. They are used for curing various ailments. These phytoconstituents possess anti-inflammatory, anti-microbial, anti-oxidant, anti-diarrhoeal and insecticidal activities. In present study, alkaloid, flavonoid, saponin etc. are found to be present in *Amaranthus caudatus* L., *Beta vulgaris* L. and *Brassica oleracea* leaves extract. Workers have reported that they are used in treatment of heart failure and cardiac arrhythmia¹⁴.

Table 1 : Phytochemical screening of *Beta vulgaris* L.

S.No.	Phytochemicals	Methanol	Chloroform	Ethanol	Distilled water
1.	Protein	-	+	+	+
2.	Saponin	+	+	+	+
3.	Phenol	+	+	+	+
4.	Tannin	+	+	+	+
5.	Flavonoid	+	+	+	+
6.	Alkaloid	-	+	+	+

Table 2 : Phytochemical screening of *Brassica oleracea* L.

S.No.	Phytochemicals	Methanol	Chloroform	Ethanol	Distilled water
1.	Protein	+	-	+	+
2.	Saponin	+	+	+	+
3.	Phenol	+	-	+	-
4.	Tannin	+	+	+	-
5.	Flavonoid	+	-	+	-
6.	Alkaloid	+	+	+	+

Table 3 : Phytochemical screening of *Amaranthus caudatus* L.

S.No.	Phytochemicals	Methanol	Chloroform	Ethanol	Distilled water
1.	Protein	+	-	-	+
2.	Saponin	+	-	+	+
3.	Phenol	+	-	+	-
4.	Tannin	+	-	+	-
5.	Flavonoid	+	-	-	+
6.	Alkaloid	+	-	+	+



Fig 1 : (a.) *Amaranthus caudatus* L. (b.) *Beta vulgaris* L. (c.) *Brassica oleracea*



Fig.2 : Protein test in d/w extract(7,5,6), ME (7,6,5), EE (6,5,7) and CE (5,7,6)



Fig. 3 : Flavonoid test in ME (6,5,7), EE (6,7,5), d/w (6,7,5) and CE (7,6,5)



Fig. 4 : Saponin test in ME (5,7,6), d/w (6,5,7), EE (5,6,7) and CE (6,7,5)



Fig. 5 : Phenol test in ME (6,5,7), d/w (7,5,6), EE (5,7,6) and CE (7,6,5)



Fig. 6 : Alkaloid test in ME (7,5,6), CE (7,6,5), EE (7,5,6) and d/w (7,6,5)

Fig. (2-6) : ME – Methanolic extract, EE- Ethanolic extract, CE- Chloroform extract, d/w – distilled water extract, *B. vulgaris*(5), *B. oleracea*(6), *A. caudatus* (7)

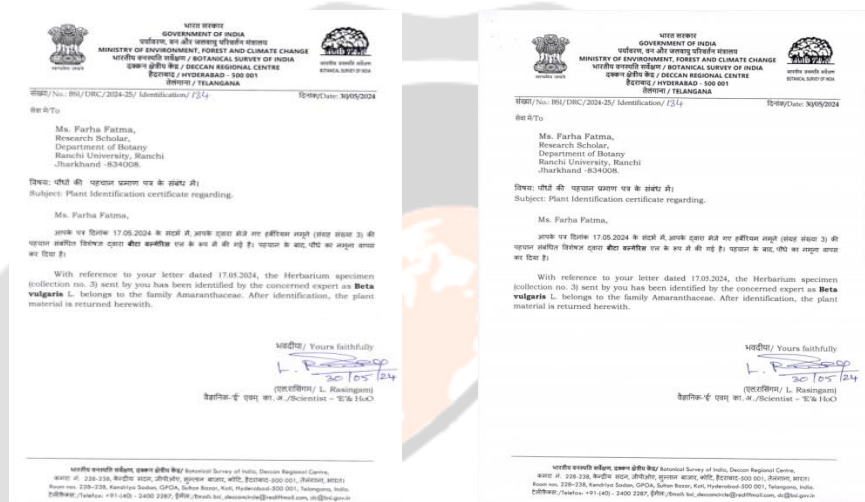


Fig. 7 : Identification certificates from BSI, Hyderabad (a.) *Beta vulgaris* L.(b.) *Amaranthus caudatus* L.

CONCLUSION

Amaranthus caudatus L., *Beta vulgaris* L. and *Brassica oleracea* are ethno-medicinal plants used for curing various ailments by indigenous people of Ranchi district of Jharkhand. These plants are easily available, highly cost effective and better compatible with human body. Presence of different phytochemicals in these plants indicates preventive and curative properties of these plants. More studies are needed for exploring other potential features of these plants such as their use in herbal drug industry and other uses.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

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