



Characterization Of Chemical Compounds And Tiny Particles From Fruits By SEM-EDX

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Abstract: The simple homemade method was employed for extraction of juice from the raw fruits. The juice, cellulose and fibre were extracted from the fresh fruits. Generally, chemical compounds can be obtained by using solvent extraction. The juice, cellulose and fiber are the components of the beet-root, sweet potato, carrot and maize. Solid substances were obtained by heating semisolid liquids of beet-root and carrot. Solids were precipitated by crystallization from the juices of sweet potato and maize. The brownish colour unrefined sugar; jaggery/gur and white solids were prepared from juice of fruits. The fruits and its juice are rich sources of carbohydrate and vitamin. Surface morphology images of the solid substances, tiny cellulose and fibres were characterized by scanning electron microscope. The observed results of the solid, cellulose and fibre were clearly displayed on the monitor screen equipped with a scanning electron microscope SEM-EDX.

Keywords: Fruits, juices, cellulose, solids, SEM-EDX

INTRODUCTION

Farmers are cultivating tap root fruits and maize crop in some places of India. Tap roots such as beetroot, sweetpotato and carrot store food. It becomes swollen to have definite and indefinite shape. The corn seeds also store food materials. The naphiforms vegetables are sweet in nature consumed raw or cooked by human beings. The colour of tap root beetroot (*Beta Vulgaris*) is a red rose [1]. It is a spherical definite shape and contains red rose colour food. Beetroot has swollen, fleshy and definite shape. The beetroots contain cellulose, fibres and juice [2]. The dark pink cellulose, fibrous mass and juice colour is similar to beetroot. Natural source of sucrose is sugar beetroot. The juice extracted from beetroots and sugar can be crystallized in the sugar industry [3, 4]. The beetroots used as raw materials to manufacture of sugar and ethyl alcohol in the industry. Beetroot juice is a medicinal useful for blood pressure patients. The tuber vegetables are sweet in nature and eaten raw or cooked by human beings. The colour of sweetpotato (*Ipomoea potato*) is reddish/pink, yellowish, cream and white. The sweetpotato does not have a definite shape and size. Sweetpotato contains yellow/cream/white food materials. The fibrous tap root sweetpotato contains cellulose, fibres and juice. The colour of wet mass and juice of sweetpotato is yellow, cream or whitish. Natural source of starch is a sweetpotato. Juice obtained from wet mass of sweetpotato and starch can be precipitated in glass [5]. The sweetpotato (*Shakarkand*) is uses raw material to manufacture of starch and ethyl alcohol in industrial products [6]. The conical root vegetables are sweet in nature and consumed raw or cooked by human beings. The colour of the tap root, carrot (*Daucus carota*) is red and orange. It is a conical definite shape and store food. The conical tap root is swollen, fleshy and has definite shapes. The carrot contains orange cellulose, fibres and juice. Natural source of carotene is carrot. Juice collected from carrot and orange colour semisolid liquid precipitated into glass. The carrots are used as a raw material to manufacture of the vitamin in medicinal factories. The maize is the Agro crop in nature and eaten cooked or fried. The color of maize (*zea mays*) corn seeds are yellow, orange and white. The corn seeds are nearly triangular in shape. The corn seeds store yellow cellulose, fibres and juice. Juice collected from corn seeds and starch can be settled in the small glass. The corn seeds of maize are used as food. The maize is useful for the preparation of starch. The corn seeds are used as raw materials in industrial products. The fruits such as beetroot, sweetpotato and maize are a rich source of carbohydrates. The conical root, carrot is a rich source of vitamins. Carbohydrate and starch are the most abundant organic compounds obtained from taproot fruits. Vitamin as carotene is an abundant organic compound obtained from carrot.

MATERIAL AND METHODS

The fruits belonging different kingdom and family were selected to present the work. The red rose, white/cream, orange and yellowish colour fruits were available in the vegetable market. The fresh fruits viz. beetroot, sweetpotato, carrot and maize were purchased from market. Fresh fruits were washed with tap water to remove any dirt on the peels. The husks and silks were removed from maize fruit. The beetroot, sweetpotato, carrot and maize fruits were dried in the shade.

The similar method was adopted for preparation of carrot halawa. The various shapes of fruits were crushed using a home appliance as a small steel crusher (*kishani*). The shapes of fruits are spherical, definite, indefinite and spindle. The wet mass (fibre and cellulose) of each fruit was collected in the crucibles.

The wet mass of the each fruit was squeezed by using lemon squeezer. The juice and wet mass (fibre and cellulose) was separated in a small plastic container and in the crucibles.

The color of the juices and wet mass (cellulose) of beetroot, sweetpotato, carrot and maize is similar to the natural source. The colour of the juice and wet mass (fibre) of sweetpotato is different from natural source. The colour of the juices and wet mass (fibre and cellulose) are given in following table 1.

Table 1: Colour of juices and wet mass of fruits

Fruits	Colour of juices	Colour of wet mass
Beetroot	Red rose	Red rose
Sweetpotato	Cream/Whitish	Cream/White
Carrot	Orange	Orange
Maize	Pale yellow	Yellowish

The juices were filtered with the help of tea filter gauge. The juices collected into small plastic glasses are shown in figures 1a to 1d.



Fig. 1a to 1d: Juices of beetroot, sweetpotato, carrot and corn seeds

About 10ml freshly prepared juice of each fruit was taken in a small beaker. The juices were kept overnight and form the layers. The upper is an aqueous liquid layer and lower thick semisolid liquids. The quantity and color of each juice of fruits are given in the following table 2.

2

Table 2: Colour, quantity, semisolids, state and solids of fruits

Colour of Juices	Quantity	Semisolids	States	Colour of solids
Red rose	10ml	2.5ml	Sticky	Buff red
Cream/Whitish	10ml	2.0ml	Moist	Creamy
Orange	10ml	1.5ml	Sticky	Orange
Pale yellow	10ml	2.5ml	Moist	Yellowish

The chemical compounds from juices of sweetpotato and corn seeds forms the moist solids in a few seconds. The chemical compounds from juices of beetroot and carrot takes more time to forms the semisolid liquids.

The upper aqueous layer of each juice was removed with a small capillary. The lower layer of semisolid liquids collected in small beaker. The moist semisolid of sweetpotato and corn seeds dried in shade and yields white solids.

Semisolid liquids of beetroot and carrot heated on water vapours using water bath. Brownish and orange color semisolids by heating solids were obtained. The yields of chemical compounds are shown in figures 2a to 2d.



Fig. 2a to 2d: Each semisolid collected into small glass

The fibrous/cellulose wet mass of each fruit was dried in the shade. A few tiny particles of fruits were used for instrumental analysis.

The most successful technique was used for elemental/mineral analysis of tiny particles and solids. The SEM model is an advanced microscope equipped with electronic devices. A small piece of adhesive carbon tape stuck on aluminium stubs and mounted in sample holders. Electron beam from the gun penetrate 0.5 cm at the focused stub and scans the sample. The surface morphology images displays on a high definition monitor.

The elemental/mineral spectrum of solids contains chemical compounds were carried out EDX incorporate field emission scanning electron microscope [VEGA 3 LMU/EDX made in USA] at an electron voltage 0.760, 5.780 and 1.090 keV.

RESULTS AND DISCUSSION

The fruits belonging different kingdom and family are natural sources for living organisms. Four types of fruits were used belongs to family *Beta Vulgaris*, *Ipomoea potato*, *Daucus carota* and *zea mays*. The size and shape of fruits are spherical, definite, indefinite and spindle. These fruits are rich sources of carbohydrate, vitamin, fiber and cellulose. Also contains protein, minerals, hemicelluloses and lignin.

The accurate quantity of beetroot and carrot juice was collected in small beaker and kept in overnight. The juices showing two separate layers, the upper is aqueous layer of pinkish color and lower semisolid layer of buff red color of beetroot juice. The upper liquid layer is faint orange and lower semisolid layer dark orange color of carrot juices. The separation of beetroot and carrot juice takes more time to forms the semisolids. The upper liquid layer and lower semisolid layer separated in small glasses. The accurate quantity of sweetpotato and maize juice was collected in beakers and kept in overnight. The separation of two layers of sweetpotato and maize juices takes a few times. The juices showing two separate layers, the upper aqueous layer of white/creamy and lower semisolid layer of yellow color of corn seeds juices.

The semisolid liquids of beetroot and carrot were heated on water vapours using water bath. The semisolid of beetroot yields solid substance like unrefined sugar/jaggery/gur [7, 8]. The brownish black solid gives characteristics sweet smell [9]. The brownish black solid is completely soluble in distilled water. The semisolid of carrot yields the orange color solid substance. The chemical compounds are the sources of carbohydrate (sucrose) and vitamin (carotene). The orange color solid gives sweet pleasant smell like carotene. Sucrose is ordinary sugar isolated from sugarcane and sugar beet as white crystalline solid.

The moist solids of sweetpotato and corn seeds were dried in shade, obtained chemical compounds. The white solid substances are partly soluble in distilled water. The yield of solid contains fine powder as like starch powder. The solid mass of beetroot, carrot, sweetpotato and corn seeds juices are shown in figures 3a to 3d.



Fig. 3a to 3d: Brownish black, orange and white colour of solids

The whitish moist chemical substance of sweetpotato gives a dirty smell. The moist solid substance is a starch gives characteristics dirty smell. The moist chemical substance of carrot shows characteristics as carotene of a vitamin. The yellowish solid of corn seeds gives smells like maize. The moist yellowish chemical substance turns white fine powder similar to starch [10]. The moist solids of sweetpotato and corn seeds kept in the shade for drying, obtained white fine powders. The solids of sweetpotato and corn seeds are converted into fine powder by grinding [11].

Cellulose/fiber tiny particles were directly equipped on adhesive carbon tape. Each aluminium stub was mounted in a rotating sample holder of scanning electron microscope. The sampling is very important to paste on upper side of adhesive carbon tape. Electron beam from the gun penetrated on the focused stub and scans the sample. The surface morphology and tiny particles displays on a high definition monitor. The tiny cellulose/fiber shows a unique size and shape of structures. The images of cellulose/fibre of beetroot, sweetpotato and carrot at 66 x, 312x and 297x magnification are shown in figures 4a to 4c.

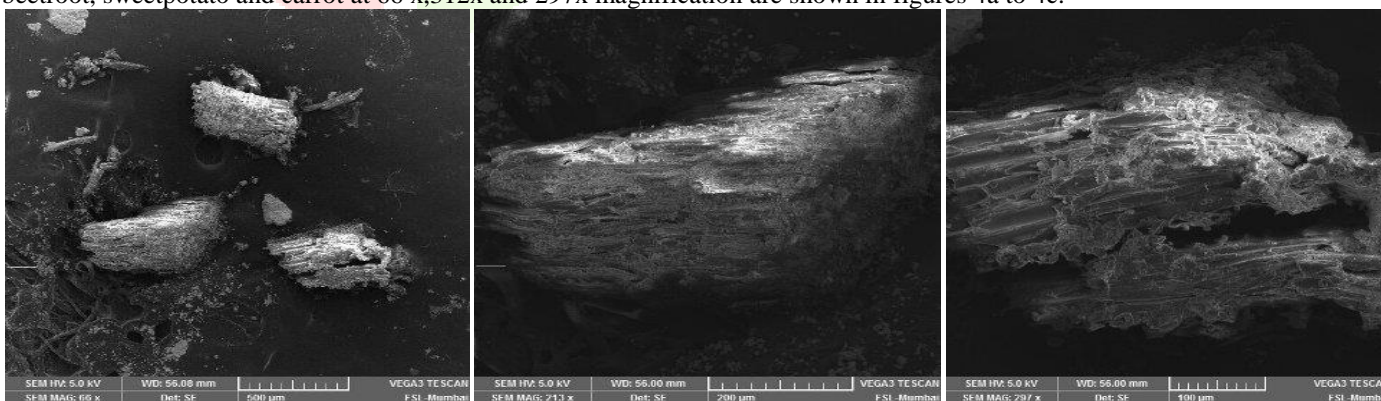


Fig. 4a to 4c: SEM images of fruit cellulose/fiber at 66 x, 312x and 297x

The solids of fruits were directly equipped on adhesive carbon tape. Each aluminium stub was mounted in a rotating sample holder scanning electron microscope. Sample of sampling is very important to paste on upper side of adhesive carbon tape. Electron beam from the gun penetrated on the focused stub and scans the sample. The surface morphology of solids displays on high definition monitor. The chemical substances show a unique size and shape. The images of beetroot, sweetpotato and carrot solids at 66 x, 312x and 297x magnification are shown in figures 5a to 5c

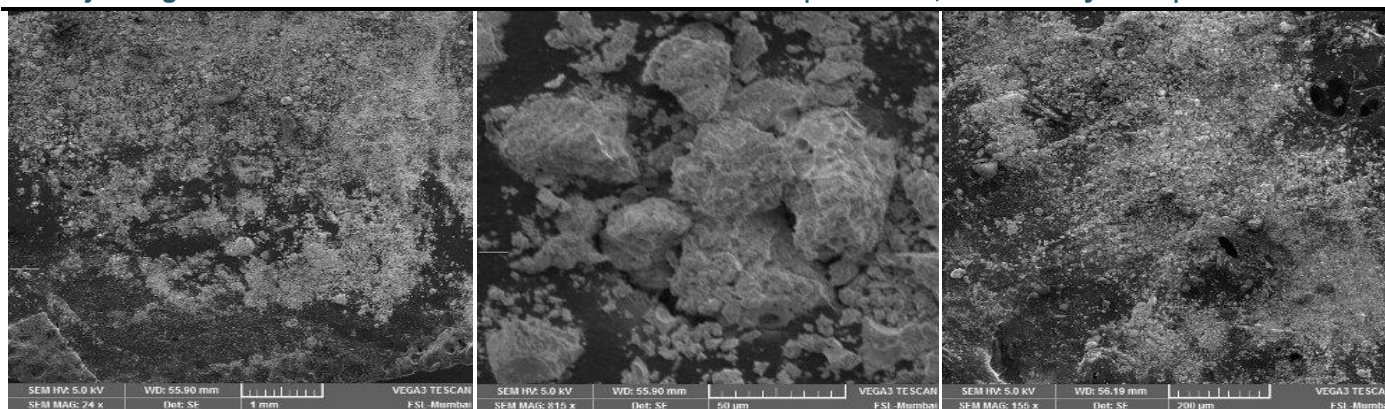


Fig. 5a to 5c: SEM images of solids at 24x, 815x and 155x magnification

The chemical compounds obtained from the juice of fruits were analysed, its contains carbohydrate, vitamin, protein, minerals, etc characterized and peaks displays on the EDX images at an electron voltage 0.760, 5.780 and 1.090 keV are shown in figures 6a to 6c.

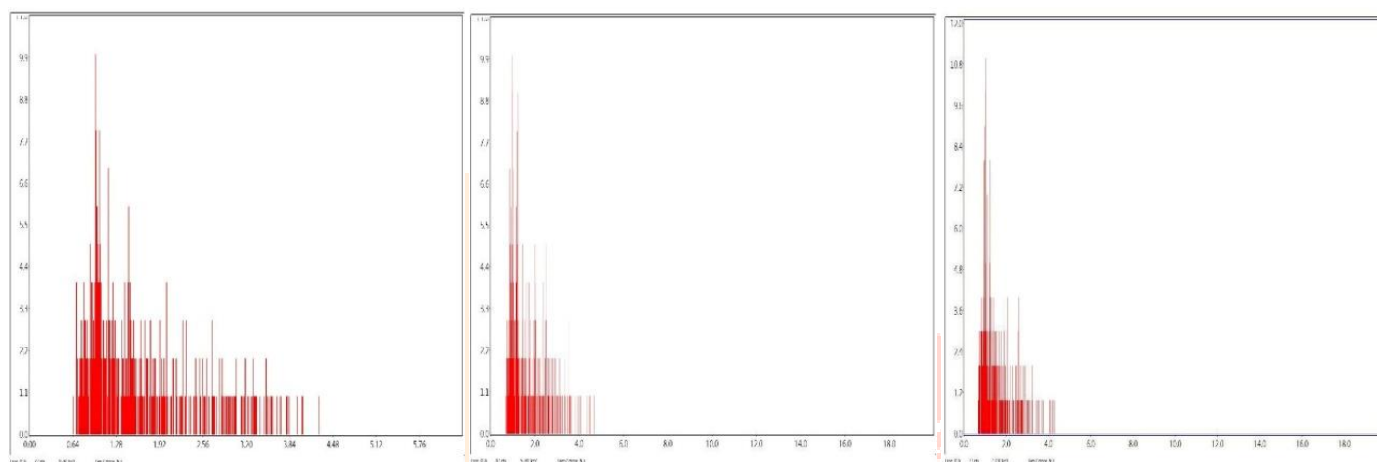


Fig.6a to 6c: Spectra of chemical compounds of beetroot, sweetpotato and carrot

CONCLUSION

In conclusion, we extracted juices from beetroot, sweetpotato, carrot and maize. The solids were prepared by heating and crystallisation method. The solids were precipitated by crystallisation from juices of sweetpotato and maize seeds. The juice of beetroot and carrot takes more time to precipitation of semisolids. The juice of sweetpotato and maize seeds takes few seconds to precipitation solids. At time of heating the semisolids of beetroot and carrot gives characteristics sweet smell and sweet pleasant smell.

The crystallisation of semisolids of sweetpotato and corn seeds obtained white solids. The buff red color semisolid liquid by heating gives brown color sweet smell like unrefined sugar, Jaggery/gur. The orange color semisolid liquid gives yellow solid of pleasant smell like carotene. The cream and pale yellow color moist solid of sweetpotato and corn seeds gives fine powder of starch. The observed results of the chemical compounds, cellulose and fibre were clearly displayed on the monitor screen.

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