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Biochemical value changes in infected Banana fruit from Jalgaon district (MS).

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Abstract:

Banana is an important fruit crop in India.Banana fruit plays a vital role in human nutrition by providing the essential growth factors such as vitamins and minerals in human daily diet. During ripening, starch contents are gradually converted to sucrose, glucose and fructose. Semi ripened and ripened fruits are susceptible to attack by microorganisms because of their high moisture and rich nutrients. The banana fruit was infected by *Verticilliumtheobromae*, *Fusariummoniliforme*, *Cladosporiummusae* and *Fusariumoxysporum*. These fungal pathogens reduced biochemical quantity of banana fruit such as dry weight, crude fiber, ash, crude protein, reducing sugar, calcium, potassium, phosphorous and nitrogen.

Keywords: Banana fruit, Biochemical, fungal pathogens.

Introduction:

Fruits are widely distributed in nature. It represent commercially and nutritionally important food product. It plays a vital role in human nutrition by providing the essential growth factors such as vitamins and minerals in human daily diet. It can helpful to keep a fine and normal health. Banana is an important fruit crop in India. Nutritionally, banana fruit is a good source of vitamins, potassium, calcium, phosphate, iron etc. During ripening, starch contents are gradually converted to sucrose, glucose and fructose and in addition water in the pulp increases. Semi

ripened and ripened fruits are vulnerable to attack by microorganisms because of their high moisture and rich nutrients. These are one of the limiting factors that influence the fruits nutritional as well as economic value due to pathogens attacked.

Materials and Methods:

Healthy and infected fruits were collected from banana fields in sterile bottles from different region of Jalgaon district. Then healthy and infected fruits were cut into small pieces. After that oven dried at 40-45^{o} C and it was powdered by using mixer and kept in Pre-sterile glass bottles. Then these powder was used for analysed biochemical changes in dry weight, crude fiber, ash, crude protein, reducing sugar, calcium, potassium, phosphorous and nitrogen.

Estimation of dry matter (DM): The dry matter (DM) was determined by taking the sample to constant weight in an oven at 95-100^{0} C. 2 gm of sample was taken in a clean dry preweighed tray and kept in oven for 48 hours or more, till constant weight. Weight of the dried sample was reported as % dry matter(Mungikar1999).

Estimation of crude fibre:2gm defatted sample was taken in 500 ml spoutless beaker and added 200ml 1.25% H_2SO_4. Then lumps of sample were broken with the help of glass rod. After that covered the beaker with a conical flask, half filled with cold water, which serves as water condenser. Boiled it for 30minutes and made up any loss in volume during boiling with hot distilled water.Then it was filtered through whatman filter paper no.54 by washing the residue several times with distilled water. Again the residue was taken in a beaker with 100ml water and added 100ml 2.5% NaOH and boiled it for 30 minutes. After boiling it was filtered through previously weighed whatman filter paper no.54and washed the residue several time by hot distilled water and lastely with 70% alcohol. Then it was dried over night at 100^{0}C to a constant weight .

Cooled and it was weighed. Incinerate the residue along withfilter paper in a crucible at 600 ± 20^0C for 2hours in a muffle furnanceuntil all carbonaceous matter is burnt. Then crucible was kept in desiccator for cooling and weighed. The weight loosed was note down and calculated the amount of crude fibre on dry matter basis.

Estimation of reducing sugar: Reducing sugar content was estimated by Nelson-Somogyi method suggested by(Somogyi1952) and mentioned in (Thimmaiah1999).The following formula was used to calculate percent of reducing sugar .

$$\%\ reducing\ sugar\ in\ sample = \frac{Sugar\ value\ from\ grapg(\mu g)}{Aliquot\ sample\ used\ (0.1\ or\ 0.2)} \times \frac{Total\ vol.of\ alcohol\ free\ extract(10ml)}{Weight\ of\ sample(100mg)} \times \frac{1}{1000}$$

Estimation of Total Ash,Acid Insoluble Ash (AIA)and Acid soluble ash (ASA): Estimation of Total Ash,Acid Insoluble Ash (AIA) andAcid soluble ash (ASA)content was carried out by the method recommended (Mungikar,1999).Acid insoluble ash (ASA)was calculated by following formula

$$Acid\ insoluble\ ash\ \% = \frac{Weight\ of acid\ treated\ ash}{Weight\ of\ sample} \times 100$$

Acid soluble ash (ASA):The percentage of acid soluble ash was calculated by subtracting the value of the percentage of acid insoluble ash from that of total ash**Estimation of calcium:**Calcium content was estimated by the method suggested by Tembhare(2008).

Estimation of phosphorus: The estimation of phosphorus content was carried out by the method suggested by Fiske and Row(1925) and Tembhare(2008) and recommended by Oser(1979).

Estimation of potassium: The potassium estimation was carried out by Flame photometer method depicted in (Tandon,2005).

Estimation of nitrogen: The nitrogen estimation was carried out by Kjeldahlmethod depicted (Tandon,2005).The nitrogen content in sample was calculated by following formula

N in %= $\frac{TV \times 0.00007 \times 100 \times 100}{0.5 \times 5}$ (1ml of N/10H_2SO_4=0.00014g N).

Result and discussion:

In present investigation the banana fruit was infected by soil borne fungal pathogens i.e. *Verticillium theobromae*, *Fusarium moniliforme*, *Cladosporium musae* and *Fusarium oxysporum*. These fungal pathogens reduced nutritive quantity of banana fruit such as dry weight, crude fiber, ash, crude protein, reducing sugar, calcium, potassium, phosphorous and nitrogen.

Maximum reduction was noted in the content of dry weight, ash, crude protein, reducing sugar, calcium, potassium, phosphorous and nitrogen due to infection of soil borne fungi *Verticillium theobromae*, *Fusarium moniliforme*, *Cladosporium musae* and *Fusarium oxysporum*. Considerable changes occurred in crude fibre as compared healthy fruit (control). The fruit was infected by *Fusarium moniliforme,* calcium content increased in fruit as compared control.Fruit of banana is very rich source of potassium. In single banana fruit 358mg to 450mg potassium is present and this amount of potassium depend on variety. Potassium content was highly reduced in banana fruit due to infection of these soil borne fungal pathogens (Table No.1),(Graph No.1).Sawant and Gawai (2011) reported that banana fruits were infected by four fungi i.e. *B. theobromae, R. oryzae, G. musarum, A. niger, A. flavus* and *F. roseum* which cause considerable biochemical change in quantity of total soluble sugar, protein, ash, ascorbic acid, mineral elements and in reducing sugar.Singh,(2011)reported banana fruit infected by *Fusarium moniliforme* has been showed decrease in total sugar content as compared to healthy banana fruit.

KedarNath (2015) mentioned that total soluble sugar content was high in healthy banana fruit but it low in infected banana fruits due to fruit rot diseases caused by *Lasiodiplodia theobromae*. Nwaukwu, et.al.,(2012) recorded that *Aspergillus niger, Aspergillus flavus, Botryodiplodia theobromae, Fusarium oxysporum, Penicillium chrysogenum* and *Rhizopus stolonifer* caused disease to edible fruit and effects on its mineral composition vitamin and proteincontent.Pawar,(2012)noted thatfungi have been responsible for loss in biochemicals content of fruit. Similar kind of result has been recorded by Rathod, (2010) ash, calcium and phosphorous content reduced in fruit due to fungal pathogen such as *Alternaria alternate, Aspergillus flavus, Aspergillus niger, Fusarium oxysporum, Fusarium moniliforme, Fusarium equiseti* and *Curularia lunata.*

Conclusion:

The nutritional content of healthy banana fruit was found to be significantly higher than the fruit infected by fungal pathogens. It means fungal pathogens reducenutritional quantity as well as market quality of banana fruit.

Table no.12-Biochemical analysis of infected banana fruit

Sr. no.	Biochemical Parameters	Control	Fruit pathogens			
			Fusarium oxysporum	*Fusarium moniliforme*	*Verticillium theobromae*	*Cladosporium musae*
1	Dry weight (gm/100gm)	32	22	19.41	16.44	21.65
2	Crude fiber (gm/100gm)	2.8	2.7	2.3	1.05	2.5
3	Crude Protein (gm/100gm)	1.15	1	1.3	1.06	1.1
4	Ash (gm/100gm)	0.98	0.4	0.3	0.2	0.5
5	% Reducing sugar in	1.9%	0.7	0.65	0.435	0.615

	100gm					
6	% Calcium in 100gm	0.6%	0.36	0.8016	0.3006	0.1002
7	% Potassium in 100gm	9.21%	1.433	1.627	1.393	1.403
8	%Phosphorous in 100gm	2.93%	0.18	0.14	0.28	0.16
9	% Nitrogen in 100gm	0.3%	0.16	0.21	0.17	0.18

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