



## Comparative evaluation of phytochemicals and anti-microbial properties of Watermelon seeds, floral parts of Tulsi and Banana peels and their use as a potential coagulant in water treatment

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**Abstract :** *This investigation deals with the potential of Watermelon seeds, floral parts of Tulsi, Banana peels as a natural coagulant for water treatment. The present study also evaluates the antimicrobial activity against common pathogen, and their qualitative phytochemicals and anti-inflammatory analysis.*

*For water treatment we use the process of coagulation. During this study, a surface water sample was collected for treatment by watermelon seed, floral part of tulsi, banana peel in powdered form which act as coagulants. In 500ml water sample 200mg coagulants were mixed. After treating the water with coagulants, water sample was analysed on*

*different parameters like pH, turbidity, hardness, alkalinity etc. All parameters were reduced after treatment with coagulants showing effective clarification agent.*

*Anti-microbial activity of these materials was determined by Agar- well diffusion method. The sample extract was used against Staphylococcus species (bacteria) and Aspergillus species (fungi). Methanolic extract of these samples show anti-microbial effect.*

*Phytochemical analysis of these materials was carried out by using various chemical tests. Results show presence of carbohydrates, alkaloids, tannins, steroids in all three extract i.e, Watermelon seeds, Banana peels, floral parts of Tulsi but protein was present in watermelon only, flavanoids were present in Banana peels and floral parts of Tulsi.*

*Anti-inflammatory activity was done by egg albumin method, dilution of extract and standard i.e, Diclofenac sodium (50mg) was prepared and absorbance was taken by using spectrophotometer.*

**Keyword:** *Watermelon seeds, Banana peel, floral parts of Tulsi, antimicrobial, turbidity, water treatment.*

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### Introduction:

Watermelon (*Citrullus lanatus*) belongs to the Cucurbitaceae family and is a source of multiple minerals, vitamins, proteins, present in their peels, pulp, seeds. It also contains phytochemicals, which provide resistance against various diseases. It has various beneficial effects against cardiovascular disease due to

antioxidant, anti-inflammatory and vasodilatory properties. *C. lanatus* is a rich source of citrulline that is responsible for the biological activities (Poduri et al. 2013). Watermelon seed has a potential for use as a natural coagulant for water treatment. The seeds of watermelon have nutritional as well as cosmetic value. They also show antimicrobial activities against various common pathogen (Ajayi et. al 2011). These seeds can be used for treating diabetes and are very effective in health recovery after illness.

Tulsi (*Ocimum sanctum*) the queen of herbs belongs to the Lamiaceae family. It is cultivated widely for religious and medicinal purposes. Historically, it was used as medicine due to its widespread healing power. Tulsi is commonly consumed in supplement form as Tulsi tea. It is used as a natural remedy for anxiety, adrenal fatigue, hypothyroidism, unbalanced blood sugar and as a home remedy for acne. It contains certain phytochemical, anti-microbial properties which help the plant to fight against diabetes, cancer and to balance the level of hormones (Bishnu Joshi et al 2011).

Banana peel is an agricultural waste that is being discarded all over the world as a useless material. It causes waste management problems although it has some compost and cosmetic potential. The substances could be used for medicine as well as personal care and are known for antimicrobial and phytochemical properties (Ehiowemwenguan, G., et. al 2014) with lots of vitamins, minerals, and fibres that are beneficial for skin care and for healing wounds. Besides that, banana peels have adsorbent potential, very useful for purification and refining processes. It is used to treat turbid water (Thuraiya Mahir Al Khusaibi, et. al 2015).

## Material and Methods :

### Materials-

Powdered watermelon seed, floral part of tulsi, banana peel.

**Apparatus used:** Conical flask, shaker, Vials, Glass rod, Pipette, Breaker, Measuring cylinder, Petriplates, Pipette can, Wire basket, Bunsen burner, Spatula, Inoculating loop, Muslin cloth, Pan balance, Physical balance, Weight box, Autoclave, Hot air oven, Incubator, Vortex shaker, Heater, Counter meter.

**Chemicals used:** Mercuric chloride, Potassium iodide, conc.HCL,  $\text{FeCl}_3$ , Sulphuric acid, NaOH,  $\text{CaSO}_4$ , Ammonia, Distilled water, Formalin, Potato dextrose agar, Nutrient agar, Dextrose, Agar, NaCl, Beef extract, pH strips, All chemicals used were Fisher scientific & Nice brand of analytical grade.

### Methods-

1. **Phytochemical analysis:** The extract of watermelon seeds, Banana peel, and floral parts of Tulsi were analysed qualitatively for tannins, steroids, carbohydrates, proteins, flavanoids, and alkaloids.

**Alkaloids:** 1.36gm of mercuric chloride and 5.00gm of potassium iodide was taken in 100ml of water (Mayer's reagent). Then dil. HCL was mixed with Mayer's reagent and powdered extract was added in it. Formation of precipitate shows presence of alkaloid in it.

**Tannins:** Powdered extract 1.0gm was taken in a test tube and 10ml of distilled water were mixed in it. After that 2 drops of 5%  $\text{FeCl}_3$  was added. Precipitate indicates the presence of tannin.

**Steroids:** Powdered form of extract was taken in a test tube. Then an equal volume i.e 10ml of chloroform and strong sulphuric acid were added. The colour changes show presence of steroids.

**Carbohydrates:** Molisch's reagent ( $\alpha$ -naphthol dissolved in ethanol). 5ml aq. solution of Extract was taken in a test tube. Then a few drops Molisch's reagent was added. After that a few drops of conc.  $\text{H}_2\text{SO}_4$  was slowly added down the sides of the sloping test tube without mixing. Formation of ring shows the presence of carbohydrate.

**Proteins:** 2ml aq. solution of extract was taken in 2ml of 10% NaOH solution. 2-3 drops of  $\text{CaSO}_4$  was mixed in it. Colour changes show the presence of protein.

**Flavanoids:** 1ml aq. solution of extract was taken in a test tube then 3 drops of ammonia and 0.5ml conc. HCl was added in it. Change in colour shows the presence of flavanoids.

## 2. Water treatment:

### Sample collection and preparation

- The raw water sample was collected from collectorate ghat located in the Northern part of Gandhi maidan. The water was collected from the side of a river by immersing a plastic container until it was full. The water was treated using the prepared coagulant.
- Watermelon seeds, Banana peels, and floral parts of Tulsi were sun dried for a few weeks and then grounded in mortar pestle. Water quality of Gangetic water was checked with different parameters without adding coagulant. Then 200mg of powdered form were mixed directly as coagulant in 500ml Gangetic water in a conical flask and kept on shaker for 2hrs at 125rpm. After 2hrs all the dirt particles settled down. It was then filtered with whatman paper. This process was repeated twice (depending on the water turbidity). Then pH, turbidity, hardness, colour, alkalinity were noted down.

## 3. Anti-inflammatory:

- Collected seeds and peels were washed and dried. Then the seeds and peels were blended to coarse powder with the help of mortar and pestle, then mixed with 10ml 95% ethanol, and filtered with muslin cloth.
- Dilution of extract and standard (Diclofenac sodium) were prepared in the concentration range of 10, 20, 40, 60, 80, and 100ug/ml.
- 0.2ml egg albumen, 2.8ml of phosphate buffered saline (PBS ph 6.4) and 2ml of varying concentration of sample extract and standard were mixed.
- A similar volume of distilled water was taken as control.
- Then the mixture was incubated at 37<sup>0</sup> C in the incubator for 15 min and then heated at 70<sup>0</sup>C for 5 min.
- After cooling, the absorbance was taken at 660nm in spectrophotometer.

## 4. Anti-microbial:

- **Preparation of Extract** : Watermelon seed, floral part of tulsi, Banana peel were collected, dried in sunlight, coarsely powered and was mixed in methanol and filtered with muslin cloth.

- **Cleaning and Sterilization of Glass Ware** : Glass wares were washed with tap water and then air dried. Petriplate and vials were wrapped with aluminium foil and kept in a wire basket and autoclaved at 15lbs\inch<sup>2</sup> (121<sup>0</sup>C) for 15 min. Pipette was kept in pipette can and left in hot air oven at 180<sup>0</sup>C for 4 hours.

- **Preparation of media**

**Composition:-** Potato dextrose agar and nutrient agar were used. The procedure that was adopted for the preparation is as follow (Aneja, K.R. 2010) :

- **Serial Dilution**

1. With the help of serial dilution method a dilution of master suspension at 10<sup>-5</sup> was prepared.
2. For serial dilution of pure culture, 0.1 gm pure culture of *Aspergillus* and *Staphylococcus* was taken from loop and mixed in 9.9ml sterilized distilled water contained in a test tubes.
3. These test tubes were shaken gently on vortex shaker until the spores were homogeneously diluted in distilled water.
4. One ml of diluted suspension was taken out and mixed in 10<sup>-2</sup> suspension.
5. Then 1ml from 10<sup>-2</sup> were taken and mixed with 10<sup>-3</sup> test tube containing 9ml distilled water and then the test tubes were shaken gently on vortex shaker.

6. This process is repeated one more time in which test tubes containing 9ml sterilized distilled water i.e.  $10^{-5}$  and were then shaken gently on vortex shaker.
7. After that, from last tube i.e.  $10^{-5}$  1ml suspension were taken and was spread homogeneously on the media.

- **Preparation of Extract :** Watermelon seeds, Banana peels, floral parts of Tulsi were collected, dried in sunlight, coarsely powdered and mixed in methanol and filtered with muslin cloth.
- **Disc-diffusion Method :**
- Blank discs were sterilized by autoclaving it. Then sterile discs were individually impregnated in extract (Kamazeri et.al 2012).
- Discs were then placed into petriplate containing suspension.
- The plates were inverted and incubated at  $26^{\circ}\text{C}$  for 24 hours.
- Then antimicrobial activities were measured by measuring diameter of zone of inhibition.

#### Result :

##### 1. Phytochemical analysis

Table 1 shows the result of phytochemical analysis.

##### 2. Water treatment:

Table 2 shows physiochemical characteristics of water before and after treatment.

##### 3. Anti-inflammatory :

From anti-inflammatory it has been observed that Tulsi (Graph No.1) is shown to be more anti-inflammatory than Watermelon seeds (Graph No.3), and least anti-inflammatory activity is shown in Banana peels (Graph No.2).

#### Discussion:

Anti-inflammatory test from watermelon seeds, banana peel, and floral parts of tulsi, showed that it is

more beneficial than any anti-inflammatory medicine because from above graph it is observed that as the concentration is increasing anti-inflammatory absorbance in tulsi is also increasing in comparison to the standard graph. And it is more beneficial in anti-inflammatory treatment.

Anti-inflammatory absorbance in banana is higher than standard graph at low concentration but as the concentration is increasing the anti-inflammatory absorbance in banana is decreasing at one point it seems to be increasing but again it start decreasing, but it is always higher than standard graph. It means that it is more beneficial for anti-inflammatory treatment.

In watermelon seed graph, it has been observed that the absorbance of watermelon seeds and standard graph is equal at low concentration but as the concentration is increasing the absorbance in watermelon seeds is also increasing.

So, from the above it is observed that tulsi is more beneficial in anti-inflammatory treatment then watermelon seeds and banana peel.

#### 4. Anti-microbial:

**Anti-fungal activity:** Methanolic extract of watermelon seed,floral part of tulsi, banana peels show zone of inhibition when tested against *Aspergillus sp.*

**Anti-bacterial activity:** Methanolic extract of watermelon seed,floral part of tulsi, banana peels show zone of inhibition when tested against *Staphylococcus.*

In this figure, methanolic extract of Watermelon seeds, Banana peels, and floral parts of Tulsi shows zone of inhibition tested against "*Staphylococcus*", 3mm, 1mm, 6mm respectively, and against "*Aspergillus*", 0.5mm, 1.5mm, 3mm respectively

#### Conclusion:

From this study we concluded that watermelon seeds, banana peels, floral parts of tulsi, showed differences in their phytochemical and anti-inflammatory properties. They are also used as a coagulant in water treatment in which watermelon seeds, is the best coagulant for water purification in comparison to others. Tulsi showed more anti-microbial activity against *Staphylococcus* and *Aspergillus* in comparison to watermelon seeds, and banana peels.

In all aspects, the natural plants are far more beneficial and harmless in side effects aspects, than the other forms of medication. Whether as regards cosmetics or health medication or any other treatment section, natural plants are proven to be the best among forms of medication in long run use.

**Acknowledgement:**

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**Table 1. Phytochemical analysis**

Test	Watermelon seeds	Banana peel	Floral parts of Tulsi
Alkaloids	+ve	+ve	+ve
Tannins	+ve	+ve	+ve
Steroids	+ve	-ve	+ve
Carbohydrates	+ve	+ve	+ve
Proteins	+ve	-ve	-ve
Flavanoids	-ve	+ve	+ve

**Table 2. Water treatment**

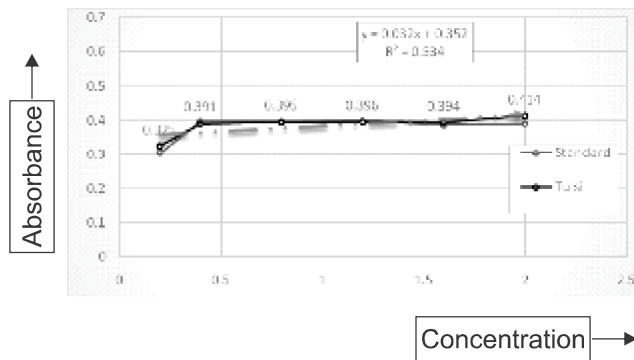
S. No.	Parameters	Before treatment	After treatment Who			Standards
			Water-melon seed	Banana peels	Floral parts of Tulsi	
1.	Colour	Brown and pale yellow	Colourless	Light brown	Colourless	Colourless
2.	pH	7.8	7.3	8.1	7.2	6.5–8.5
3.	Turbidity (NTU)	129	5.8	15.6	6.8	5 max
4.	Alkalinity (mg/ml)	323	105	172	100	200

**LIST OF FIGURE**

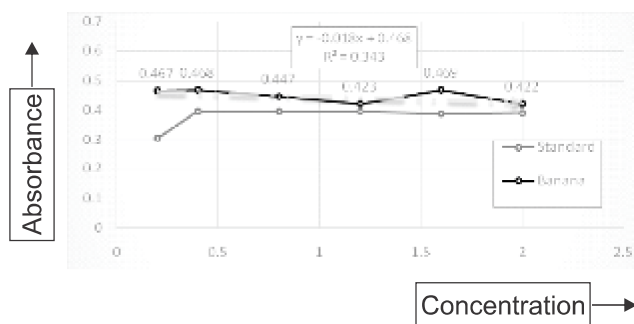


Fig. Powdered form of Watermelon seed, Banana peel and floral parts of Tulsi

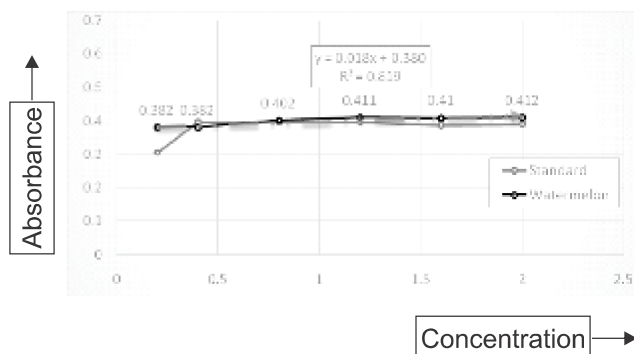
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**Graph No.1. Showing anti-inflammatory absorbance in Tulsi**



**Graph No. 2. Showing anti-inflammatory absorbance in Banana**



**Graph No. 3. Showing anti-inflammatory absorbance in Watermelon**



**Graph No. 4. Showing (zone of inhibition) of extract against bacteria and fungi**

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