



BATHUKAMMA - STATE FESTIVAL OF TELANGANA – A GREAT QUALITY OF PURIFYING POTABLE WATER

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ABSTRACT

India is the country known for its culture and traditions, one among them is festival of flowers celebrated in Telangana with a traditional importance. Bathukamma is one of the most traditional festival in Telangana with great scientific evidences. It is a floral festival, and this festival was celebrated for nine days. In each day bathukamma is prepared with beautiful different flowers such as Tangadu, Gunugu, Gulabi, Mandara, Chamanthi etc. After playing in the colony this bathukamma is immersed in water bodies such as Ponds, Lakes, Streams and reservoirs which are the main sources of potable water. The present study was aimed at evaluating the antimicrobial and antioxidant activity of water. In the present investigation gel diffusion array method was used for antimicrobial activities against the microbial contaminants. During the period of investigation water sample were collected from Komati Cheruvu Lake of Siddipet in Telangana and analysis is made at 3, 5 & 7 days, the bacterial pathogens were identified and the antimicrobial property is measured with extracts of Flower used in the bathukamma. It is also concluded that antimicrobial activities were shown by flowers extractions which are used in preparation of bathukamma.

Keywords: Bathukamma, Antimicrobial activity, Salmonella, *Rosa*, *Hibiscus*, Siddipet dist.

Introduction:

Bathukamma is a flowers festival celebrated predominantly in Telangana . Every year this festival is celebrated as per Sathavahana calendar for nine days starting Mahalaya Amavasya (also known as Mahalaya Amavasya or Pitru Amavasya) till Durgashtami, usually in September–October of Gregorian calendar. Bathukamma is celebrated for nine days during Durga Navratri. It starts on the day of Mahalaya Amavasya and the 9-day festivities will culminate on "Saddula Bathukamma" or "Pedda Bathukamma" festival on Ashwayuja Navami, popularly known as Durgashtami which is two days

before Dussehra. Bathukamma is followed by *Boddemma*, which is a 7-day festival. Boddemma festival that marks the ending of Varsha Ruthu whereas Bathukamma festival indicates the beginning of Sarad or Sharath Ruthu.

Bathukamma represents cultural spirit of Telangana. Bathukamma is a beautiful flower stack, arranged with different unique seasonal flowers most of them with medicinal values, in seven concentric layers in the shape of temple gopuram. In Telugu, 'Bathukamma' means 'Mother Goddess come Alive' and Goddess Maha Gauri-'Life Giver' is worshipped in the form of Bathukamma – the patron goddess of womanhood, Gauri Devi.

Historically, bathukamma meant "festival of life" and was celebrated to thank Goddess Parvati for her blessings for the crop harvest and income she helped generate this (current) year and again ask her blessing for the next year. Bathukamma means 'come back to life mother' and it is an asking for Goddess Sati to return. Legend has it that Sati returned as Goddess Parvati and therefore the festival is also dedicated to Goddess Parvati.

Men in the house gather flowers Bathukamma Flowers from the wild plains like Celosia, Senna, Marigold, Chrysanthemum, Indian Lotus, Cucurbita leaves & flowers, *Cucumis Sativus* leaves & flowers, *Memecylon edule*, *Tridax procumbens*, *Trachyspermum ammi*, Katla, Teku Flowers, etc., which bloom in this season in various vibrant colors all across the uncultivated and barren plains of the region. Preparing a Bathukamma is a folk art. Women start preparing Bathukamma from the afternoon. They cut the flowers leaving the little length base, some dip Gunugu (*Celosia*) flowers in various vibrant colours, some scented and arrange them on a wide plate called *Thambalam*. Women pray the Goddess by singing songs. The songs are to invoke the blessings of various goddesses.

Each day has a name mainly signifying the type of "naivedyam" (food offering) offered. Most of the naivedyam offered are very simple to prepare, and usually young children or young girls are mainly involved in the preparation of the offerings for the first eight days of the festival. The last day, called saddula Bathukamma is when all the women take part in the preparation. Following is the list of names for each day and the naivedyam offered on that day.

As this festival falls immediately after rainy season in the month of September – October. Hence the water bodies will be full of flooded water in the ponds. Which are prone to higher microbial count which contain many diseased pathogens hence our research is objected in such a way how long our traditional festival helps in purifying the potable water bodies getting down the microbial count with the flowers and leaves merged in water bodies after festival. Have a great quality of purifying water and such flowers when immersed in abundance into pond have the effect of cleansing the water and making the environment much better. Our present investigation shows that flowers has antimicrobial property.

Bacteria are ubiquitous in nature (**Holding and Collee, 1971**). They grow profusely under suitable conditions of temperature, moisture and relative humidity (**Akineyemi et al., 2009**). Bacteria have so many beneficial and harmful effects. Some of their beneficial effects include in the cycle of elements, food source for man and other animals (**Prescott et al., 2005**) and transformation of organic materials to mineral and modification of substances for use by other organisms (**Bean et al., 1996**). On the other hand, their harmful effects are seen in the destruction of plantation, decay of food, and agents of diseases and epidemics (**Campbell et al., 1998**).

All living organism are endowed with a large and varied bacterial biota (**Ekrakene and Igeleke, 2007**). India is known for its traditional and celebrations of festival. Every festival has a scientific reason to support its celebrations in this regard, present study is planned to evaluate pharmacological activity of flowers used in festival which has been declared as a state festival in Telangana.

It is a floral festival in which every day various coloured flowers are arranged row after row in a brass plate, called as, placed in front of deity and daily worshipped for a week. In the evening it is carried to nearby pond or river and immersed in to it. Festival is celebrated in the state of Telangana and our present investigation shows that flowers has antimicrobial property.

Celosia argentea is most important flowers used in this festival. It is commonly known as sliver cock's comb, safaid murga (gungu in telugu), belongs to family Amaranthaceae. It is a common weed throughout India and used in traditional medicine for diarrhea, dysentery, abdominal pain etc. it is known to possess anti-bacterial activity against several burn and wound pathogenic bacteria (**Gnanmani et al., 2003**).

Casia fistula has been proved to be an ethanomedicinal plant with antimicrobial activity (**Sivaraj et al., 2015**). *Hibiscus cannabinus* exhibited good analgesics and anti-inflammatory activity (**Chaudariet al., 2015**). *Celosia argentea* is used as anti-inflammatory, antioxidant and antibacterial agent (**Eseoghene et al., 2015**). *Tagetes erecta* an important flower used in several festivals. This plant as a whole has medicinal properties (**Preethi et al., 2012**). There are phytochemicals like tagetones and ocimenones in this plantis also a good source of phytotoxin alpha terithienyl which is used against mosquitoes (**Ravikumar et al., 2010**).

Evaluation of antibacterial activity of *Cassia auriculata* L. ethanobotical leaflets (**Maneemegalai et al., 2010**). Antioxidant and antibacterial activities of hibiscus (*Hibiscus rosa sensis*) and cassia (*Senna bicarpsularis*) flower extract (**Yin wei mak et al., 2012**). Analgesics and anti-inflammatory activity of ethyl acetate extract of *Hibiscus cannabinus* (L) seed extract (**Chaudhari et al., 2015**).

Cassia auriculata plant and its parts are useful for treatment of various disorders in human like diabetes, liver toxicity, fungal infection, microbial infection (**Joy et al., 2012**). This plant showed antibacterial activity (**Anushia et al., 2009**).

Material and Methods:

The present study was aimed at evaluating the antimicrobial activity of different flowers used in floral festival called Bathukamma. The water samples were collected from drinking water source of Siddipet called Komati Cheruvu. The samples were distributed into different vessels containing the flowers of each type used in the Bathukamma and microbial count was determined at regular time intervals comparing with the control and bacteria were identified. Using standard protocols and methodologies.

The antimicrobial activity was evaluated by measuring the diameter of inhibition zone using gel diffusion assay. The experiment was carried out and the diameter of the inhibition zones was calculated.

In the present study all the samples showed presence of high microbial loads consisting of Pathogenic microorganisms like fecal coliforms, Streptococci, *Salmonella typhi* and other Bacillus species. It is evident from the study that the microbial count came down due to the antimicrobial activity of flowers immersed in the water bodies during festival. Of crude flower and leaf extract tested like *Hibiscus rosa sinensis*, *Tagetes erecta*, *Celosia argenta*, *Cassia auriculata*, *Cucurbita maxima*. Most of them are with inhibitory zone greater than 10mm. few of them have shown moderate inhibitory action. Gram positive bacteria employed were more inhibited than Gram negative bacteria. *E.coli* and Proteus were least inhibited by all extracts. *Staphylococcus* was effectively inhibited by all extracts used.

Hence, the floral festival celebrated in Telangana state in India during Dusshera, has scientific support due to the medicinal values of flowers used. The current study of antimicrobial properties of the flowers aids in understanding how they purify water bodies and make the environment much better. Traditional knowledge especially on the medicinal uses of plants has provided many important drugs of modern medicine. Even today this area holds much more hidden treasure as almost 80% of the human population in developing countries is dependent on plant resources for healthcare. The primary objective of our study is to summarize information on traditional and medicinal secrets of flowers used in the floral festival of Telangana State. This may help in identifying research gap and suggesting perspectives for future research.

a. Collection of samples:

The samples were collected on the day of the experiment from the potable water resource of Siddipet district called Komati cheruvu in big cans which were brought to the microbiology laboratory of GDC (A), Siddipet College and then transferred the water into small buckets and isolations were by spread plate methods. Then flowers and leaves which is used in festival like Gunugu (*Celosia agrentea*), Tangedu (*Senna auriculata*), Pumpkin (*Cucurbita maxima*), Hibiscus (*Hibiscus rosa sinensis*), Marigold (*Tagetus erecta*), Rose (*Rosa*). Were collected this plants and flowers nearby Siddipet and our college

surroundings. And placed the flowers in that buckets and sampling were done at regular intervals i.e., days of 1,3,5,7.

b. **Isolation and enumeration of bacteria:**

The nutrient agar was prepared in 500ml flask and was sterilized by autoclaving at 121^oC at 15 psi for 20 minutes. 20 ml of the media was poured in the petri plates before getting solidified. The water sample with 10⁶ dilutions were plated streaked on the plates of Nutrient agar and spreaded with spreader. The plates were incubated at 37^oC for 24 hours. The plates were then observed for growth and a colonial description of the isolates.

The nutrient agar medium was used in the study for isolation of the bacteria. The sampling was done at regular intervals of time as mentioned for each sample respectively. The cultures were incubated at 37^oC and checked for bacterial growth at 24 hours. Separate colonies were sub cultured onto nutrient agar to obtain pure culture. Morphological Characteristics of colonies and gram stain tests and biochemical tests were, according (Ramos, 2004; Ekrakene and Igeleke 2009) that used for bacterial identification.

c. **Maintenance of pure cultures:**

Selected colonies were again sub- cultured on nutrient agar in petri- plates to isolate pure culture. After isolating pure cultures, bacterial isolates were further identified and characterized by size and shape and Gram staining of colonies. The bacterial colonies that appeared on the agar are transferred on to the slants of the same composition and incubated at the same optimized conditions.

d. **Characterization of bacterial isolates:**

The isolates were characterized based on their morphological, biochemical, cultural and physiological features.

e. **Biochemical characterization:**

Biochemical characterization of isolates was done by conducting different biochemical tests including IMVC, H₂S production, casein hydrolysis, starch hydrolysis, gelatin hydrolysis, lipid hydrolysis, melanin production and nitrate reduction were performed.

f. **Plant collection:** Plant materials were collected in fresh condition from nearby our surroundings after critical examination.

Preparation of crude extract:

Fresh matured leaves, flowers and bulb (25g) were collected and washed with distilled water. Samples were cut into pieces and crushed in a mechanical mortar with 25 ml of sterilized distilled water the extract was filtered off and transferred into a closed container.

➤ **Test for the microorganisms:** The bacterial strains used for the screening were

Gram – negative bacteria	Gram - positive bacteria
<i>Escherichia faecalis</i>	<i>Bacillus subtilis</i>
<i>Proteus mirabilis</i>	<i>Staphylococcus aureus</i>
<i>Psuedomonas aeruginosa</i>	
<i>S. typhi</i>	

➤ **Determination of antibacterial activity: Gel Diffusion Assay:**

Nutrient agar (NA) plates were seeded with 8 hours broth culture of different bacterial. In each of this plates, 4-5 wells (10 mm) were cut out using sterile curl borer. Using sterilized dropping pipettes, 0.3 ml of extract was carefully added into the wells and allowed to diffuse at room temperature for 2 hours. The plates were then incubated at 37°C for 18- 24 hours for the bacterial pathogens the antimicrobial activity was evaluated by measuring the diameter of inhibition zone. The experiment was carried out in triplicate and the mean of the diameter of the inhibition zones was calculated.

Results& Discussion:

In the present investigation the samples were collected and examined in the laboratory. On the day of sample collection the control (water sample) was examined and 100×10^6 CFU/ml colonies are observed after a day of incubation. Bacteria isolated from control include *Bacillus subtilis*, *Staphylococcus aureus*, *E coli*, *Klebsiella Pnuemonia*, *Pseudomonas aurigenosa*, *Proteus vulgaris*.

It is evident from **Table-1** (Fig:1) that the *Tagetes erecta* has highest number of colonies (49×10^6 CFU/ml) next was observed in *Celosia argentia* (45×10^6 CFU/ml) and lowest number of colonies occupied by *Cassia auriculata* (35×10^6 CFU/ml) but these samples have less number of colonies when compared to control on day -3.

It is evident from **Table-2** (Fig:2) that the *Rosa* has more number of colonies (44×10^6 CFU/ml) and lowest number of colonies (30×10^6 CFU/ml) is observed in the *Cassia auriculata* sample. Again these both samples have least number of colonies when compared to control sample on day-5.

It is evident from **Table-3** (Fig: 3) again *Tagetes erecta* marks highest number of colonies (38×10^6 CFU/ml) next was *Rosa* which has (34×10^6 CFU/ml) colonies and least number of colonies

(28×10^6 CFU/ml) was observed in *Cassia auriculata*. But all these samples have least number of colonies when compared to control on day-7.

When compared to table 1, 2 and 3 (**Table-4**) *Tagetes erecta* has marked highest number of colonies next to *Celosia argentea* and *Cucurbita maxima* and least number of colonies is observed in *Cassia auriculata*.

The isolates were named from control (water sample) and are given in **Table-5**. And they were identified as Pw1-Pw14. These isolates were characterized based on their morphological, biochemical and cultural, physiological features and presented in **Table- 6** and they were identified as *Bacillus spp*, *Staphylococcus*, *E coli*, *Klebsiella*, *Pnuemonia*, *Pseudomonas*, *Protues vulgaris*.

All the flowers and leaves employed gave out sticky, dark brown to chocolate, yellow and green coloured extracts. After pouring these extracts into the wells, prepared in NAM plates using **gel diffusion assay**. They exhibited different zones of inhibitions of crude flower extracts tested *Cassia auriculata*, *Tagetes*, *Celosia* and *hibiscus rosa sineses* have shown very good activity of inhibition compared to others **Table -7**. Most of them have inhibitory zone 10mm other have shown moderate inhibitory action. Highest zone of inhibition (19mm) was shown by *Hibiscus rosa sinensis* for *Staphylococcus aureus*. And lowest zone of inhibition (5mm) was shown by *Cucurbita maxima* for *E coli*.

Of crude leaf extract tested, *Celosia*, *Curcurbita*, *Tagetes* have shown great activity towards inhibition than compared to other **Table- 8**. Most of them have inhibitory zones greater than 15mm and other shown moderate inhibitory action. Highest zone of inhibition (25mm) was shown by *Celosia argentea* for *klebsiella* and lowest zone of inhibition (9mm) was shown by *Rosa* for *klebsiella*. Greater Antimicrobial action was exhibited by *Tagetes*, *Celosia* and *Cucurbita* extracts. All the flower extracts showed antimicrobial action against disease causing microorganism. *Cassia* has been proved to be an ethano medicinal plant with antimicrobial property.

Table: 1 Enumeration of bacterial isolates from water sample on day-3

S. No.	Sample	pH	Colonies X 10 ⁶ (cfu/ml)
1	Control (water sample)	8	55
2	<i>Cassia auriculata</i> (Thangedu)	6	50
3	<i>Tagetes erecta</i> (Marigold)	7	49
4	<i>Celosia argentea</i> (Gungu)	6	45
5	<i>Cucurbita maxima</i> (Pumpkin)	7	52
6	<i>Hibiscus rosa sinensis</i> (Hibiscus)	8	40
7	<i>Rosa</i> (Rose)	8	50

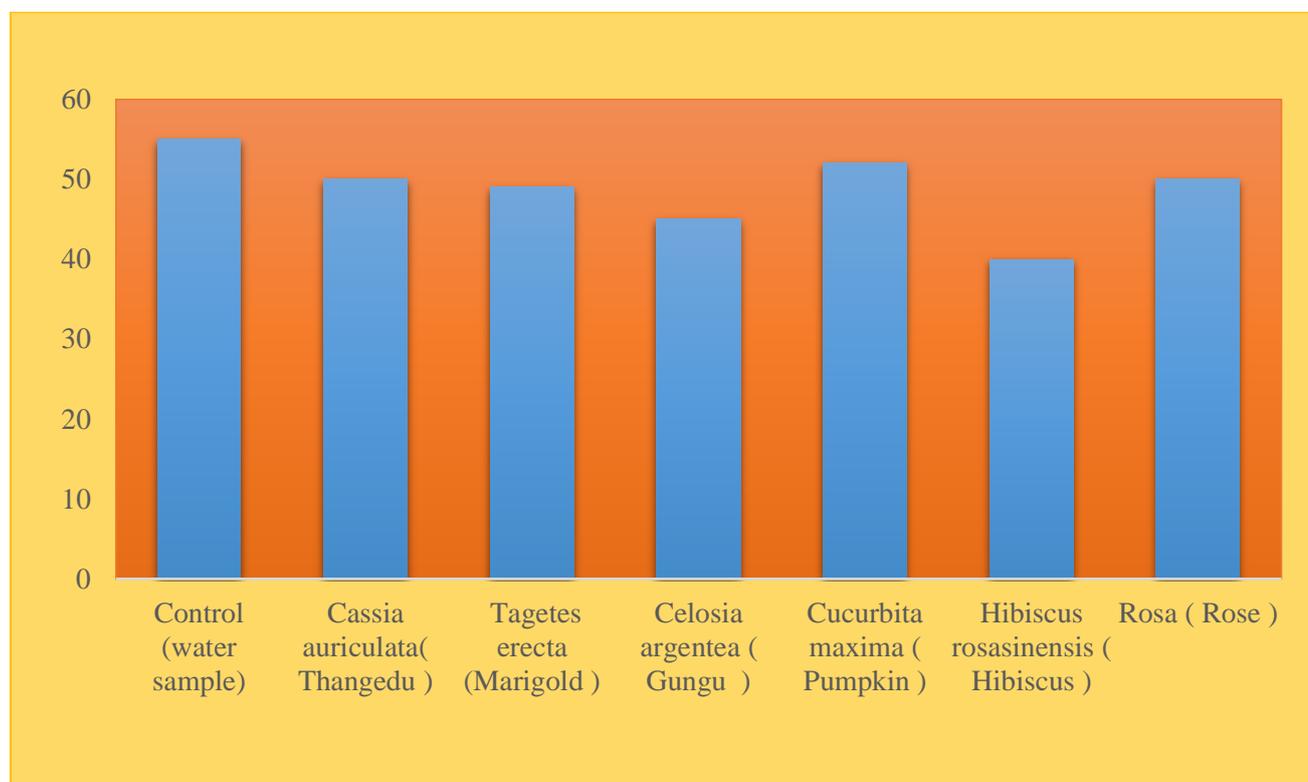
Fig:1 Enumeration of bacterial isolates from water sample on day-3

Table: 2 Enumeration of bacterial isolates from water sample on the day-5

S. No.	Sample	pH	Colonies X 10 ⁶ (cfu/ml)
1	Control	8	50
2	<i>Cassia auriculata</i> (thangedu)	5	45
3	<i>Tagetes erecta</i> (marigold)	6	43
4	<i>Celosia argentea</i> (gungu)	6	40
5	<i>Cucurbita maxima</i> (pumpkin)	5	47
6	<i>Hibiscus rosasinensis</i> (hibiscus)	7	38
7	<i>Rosa</i> (rose)	6	42

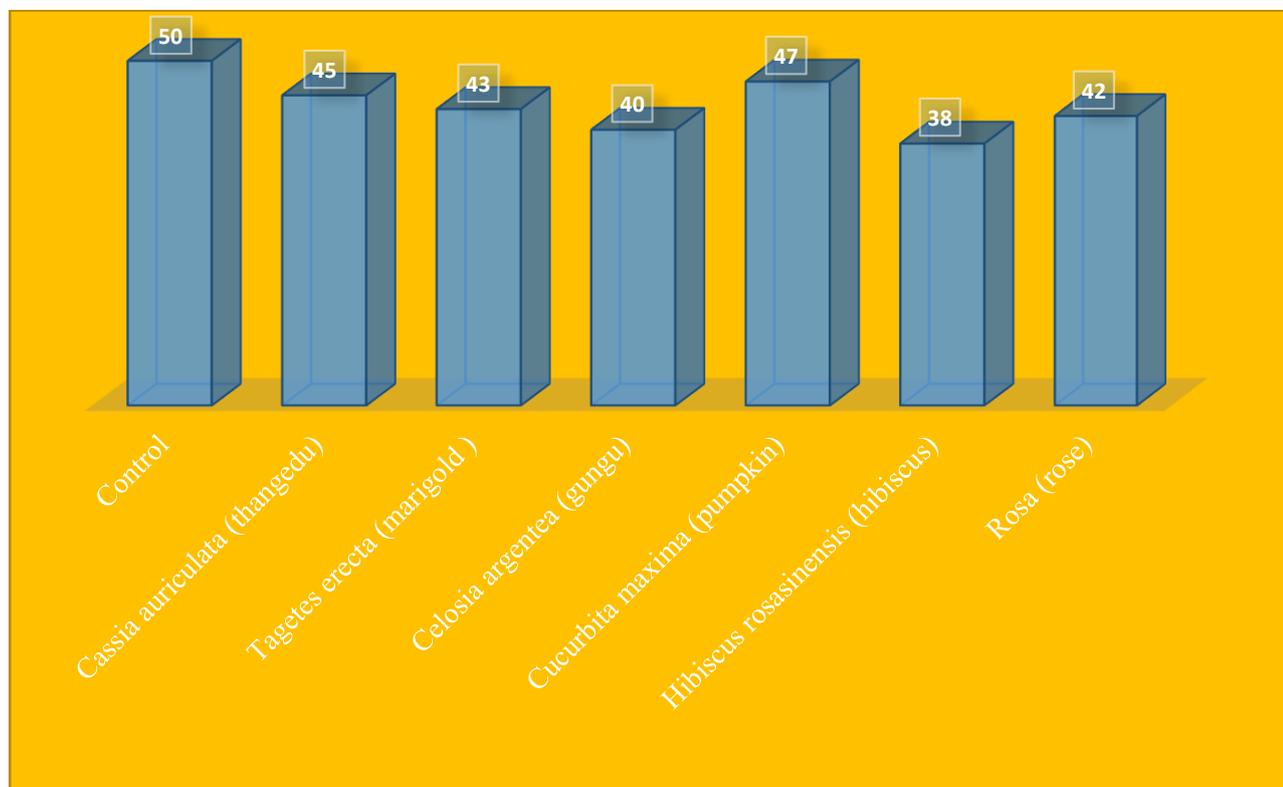
Fig: 2 Enumeration of bacterial isolates from water sample on the day-5

Table: 3 Enumeration of bacterial isolates from water sample on day-7

S. No.	Sample	pH	Colonies X 10 ⁶ (cfu/ml)
1	control	8	47
2	<i>Cassia auriculata</i> (thangedu)	4	40
3	<i>Tagetes erecta</i> (marigold)	5	38
4	<i>Celosia aregentea</i> (gungu)	4	32
5	<i>Cucurbita maxima</i> (pumpkin)	3	40
6	<i>Hibiscus rosa sinensis</i> (hibiscus)	6	30
7	<i>Rosa</i> (rose)	5	34

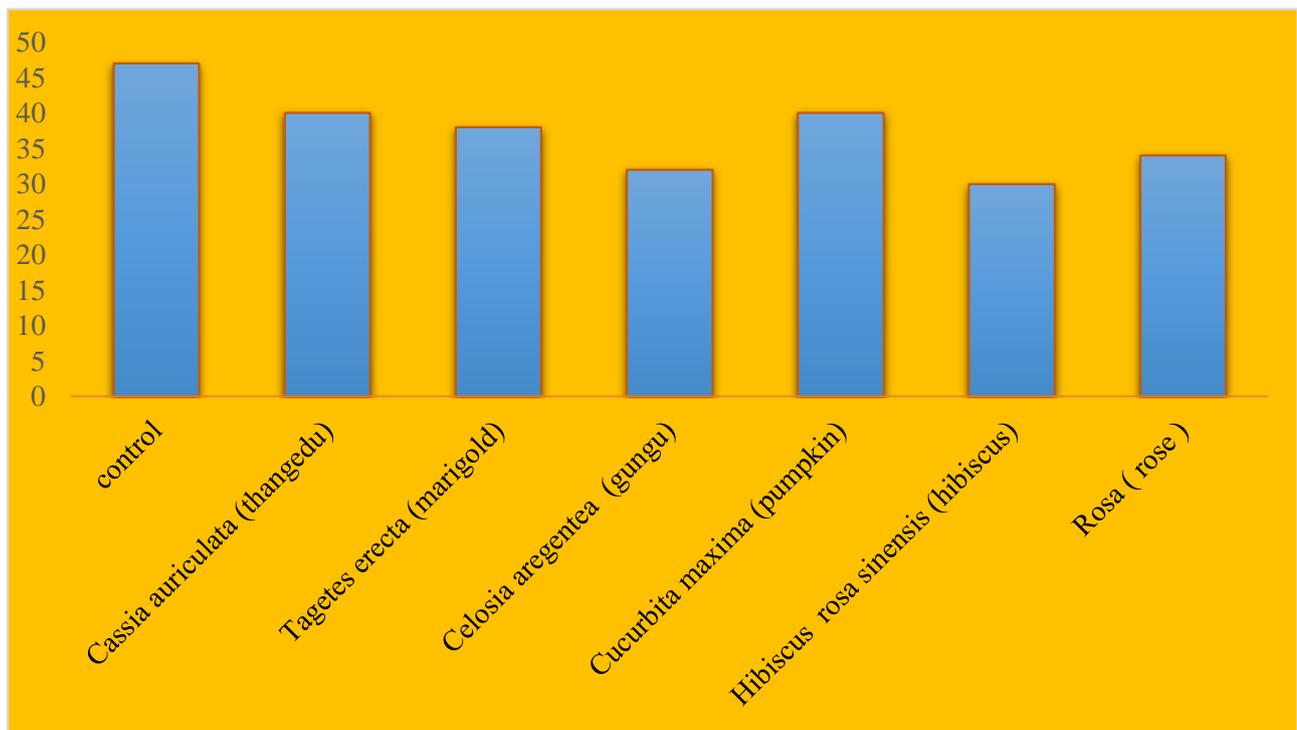
Fig: 3 Enumeration of bacterial isolates from water sample on day-7

Table 4: comparative table of day 3, 5 and 7.

S. No	Sample	Colonies X 10 ⁶ (cfu/ml)		
		Day 3	Day 5	Day 7
1	Control (water sample)	55	50	47
2	<i>Cassia auriculata</i> (thangedu)	50	45	40
3	<i>Tagetes erecta</i> (marigold)	49	43	38
4	<i>Celosia argentea</i> (gungu)	45	40	32
5	<i>Cucurbita maxima</i> (pumpkin)	52	47	40
6	<i>Hibiscus rosa sinensis</i> (hibiscus)	40	38	30
7	<i>Rosa</i> (rose)	50	42	34

Fig: 4 Comaparative graph of day 3,5 and 7.

Table 5: Showing isolates and source data

S.NO.	Isolates	Source
1	Control	Pw1
2	Control	Pw2
3	Control	Pw3
4	Control	Pw4
5	Control	Pw5
6	Control	Pw6
7	Control	Pw7
8	Control	Pw8
9	Control	Pw9
10	Control	Pw10
11	Control	Pw11
12	Control	Pw12
13	Control	Pw13
14	Control	Pw14

Table 6: Morphological and Biochemical characteristics of bacterial isolates from samples

Isolates	Gram	Shape	Indole	Oxi dase	Catal yse	Cit	Ur ea	Co ag	Nit ra	Gl u	La c	Identification
Pw1	+	Cocci	-	-	-	-	-	-	-	+	+	<i>Staphylococci</i>
Pw2	-	Rod	+	-	+	-	-	*	+	+	+	<i>E coli</i>
Pw3	+	Cocci	-	-	+	+	+	+	+	+	+	<i>Staphylococci</i>
Pw4	+	Rod	-	-	+	+	-	-	+	+	*	<i>Bacillus spp</i>
Pw5	+	Cocci	-	-	-	-	-	-	-	+	+	<i>Streptococcus faecalis</i>
Pw6	-	Rod	+	-	+	-	-	*	+	+	+	<i>E coli</i>
Pw7	-	Rod	-	-	+	-	-	*	+	+	-	<i>Salmonella thphi</i>
Pw8	+	Rod	-	-	+	+	+	-	+	+	*	<i>Bacillus spp</i>
Pw9	-	Rod	-	-	+	+	+	-	+	+	+	<i>Klebsiella spp</i>
Pw10	+	Cocci	-	-	+	+	+	+	+	+	+	<i>Staphylococcus</i>
Pw11	-	Rod	+	-	+	+	+	*	+	+	-	<i>Protues vulgaris</i>
Pw12	-	Rod	-	-	+	+	+	-	+	+	+	<i>Klebsiella spp</i>
Pw13	-	Rod	-	-	+	*	+	-	-	+	+	<i>Pseudomonas spp</i>
Pw14	-	Rod	+	-	+	-	-	*	+	+	-	<i>Salmonella spp</i>

Table 7: Inhibition zones (mm) shown by flowers extract against gram Positive and gram negative bacteria.

Flower extract used	Bacillus subtilis	Staphylococcus aureus	Escherichia coli	Klebsiella pneumonia	Pseudomonas aurigenosa	Protues vulgaris
<i>Cassia auriculata</i> (thangedu)	19	16	15	15	9	12
<i>Tagetes erecta</i> (marigold)	13	18	12	12	12	11
<i>Celosia argentea</i> (gungu)	18	14	13	13	12	11
<i>Cucurbita maxima</i> (pumpkin)	6	10	8	8	6	6
<i>Hibiscus rosa sinensis</i> (hibiscus)	15	20	13	13	14	12
<i>Rosa</i> (rose)	6	10	8	8	5	6

Fig: 5 Inhibition zones shown by flowers extract (1gr/ml) against gram positive and gram negative bacteria.

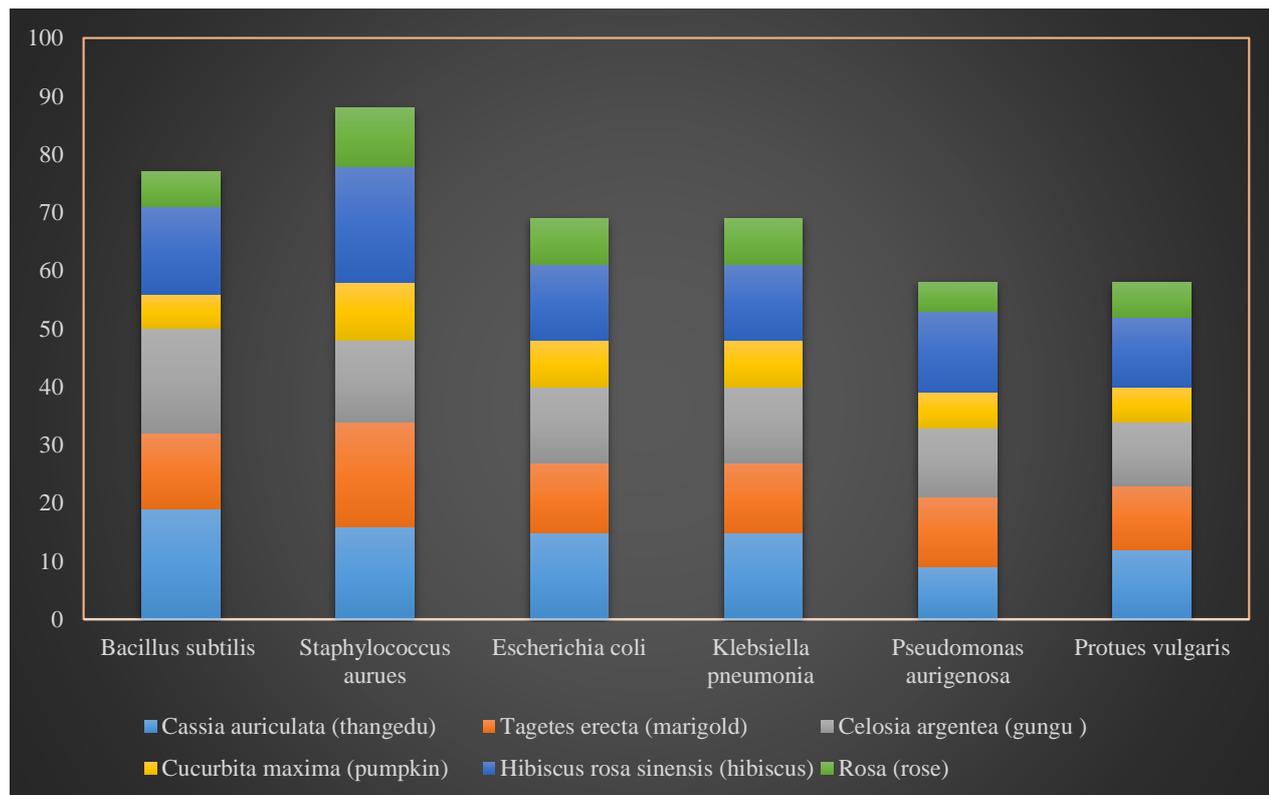
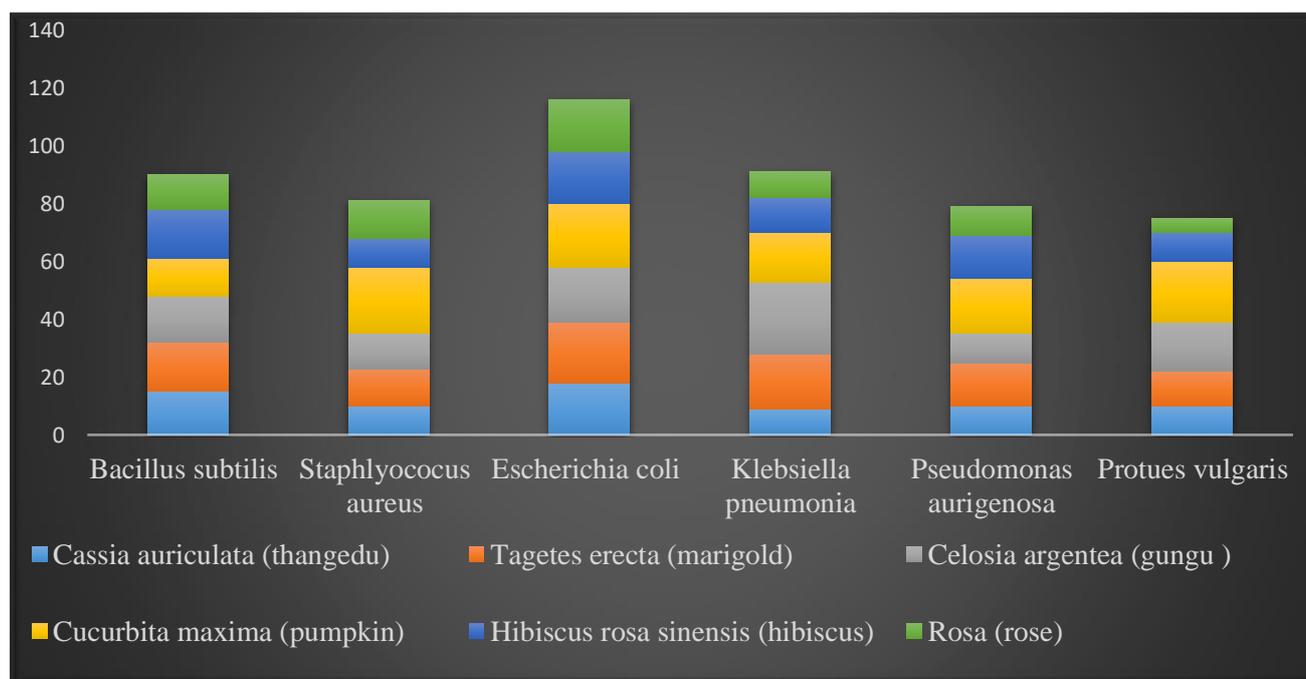


Table:8 Inhibition zones (mm) showed by leaves extracts against gram positive and gram negative bacteria.

Leaves extract	<i>Bacillus subtilis</i>	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Klebsiella pneumonia</i>	<i>Pseudomonas aurigenosa</i>	<i>Protues vulgaris</i>
<i>Cassia auriculata</i> (thangedu)	15	10	18	9	10	10
<i>Tagetes erecta</i> (marigold)	17	13	21	19	15	12
<i>Celosia argentea</i> (gungu)	16	12	19	25	10	17
<i>Cucurbita maxima</i> (pumpkin)	13	23	22	17	19	21
<i>Hibiscus rosa sinensis</i> (hibiscus)	17	10	18	12	15	10
<i>Rosa</i> (rose)	12	13	18	9	10	5

Fig:6 Inhibition zones (mm) showed by leaves extracts against gram positive.

CONCLUSIONS AND SUGGESTIONS

Many pathogenic bacteria was observed from the control plate, which was not developed in other plate where Bathukamma were immersed. The present investigation showed that the control plate have high bacterial load, than any other plates it clearly shows that the flower have antimicrobial property.

Tegetes erecta is an important flower used in several festivals, this plant as a whole has medicinal properties. There are phytochemicals like tagetones and ocimenons in this plant. Tegetes is also a good source of phytotoxin alpha terthienyl which is used against mosquitoes. The presence of aromatic makes this plant a good candidate with insecticidal properties (**Gordana et al., 2003**).

Studies revealed that ethanolic seed extract of hibiscus cannabinus exhibited good analgesics and anti-inflammatory activity (**Chowdary S R et al., 2015**)

Celosia argentea is also known as “Shokoyokota” among yorubas, which means “make husbands fat” which is used as anti-inflammatory antioxidant and anti-bacterial agent (**Eseoghene O et al., 2015**).

Hibiscus extracts have been long used in skin care treatment. Hibiscus contain high levels of vitamin C, which is potent antioxidant. This flower also has anti-inflammatory properties that help in preventing acne (**Anusha et al., 2011**)

In classifying the anti-bacterial activity as a gram-positive or gram-negative, it would be active against gram-positive than gram-negative bacteria (**Mc Cutcheon et al., 1992**). However in this study large number of the extracts were active against both gram-positive and gram-negative bacteria, while a relatively a less number were active against gram-positive bacteria alone. Through our study we came know that festival is not only have traditional benefits but also scientific benefits.

As we know that festival will come in the rainy season, so at that time the rivers and ponds are filled with water and flowing with high drift and have high load of bacterial contamination, so by our experiment we conclude that flowers have anti-microbial properties so it kills the harmful pathogenic bacteria and helps people by saving them from dreadful disease who are drinking that water.

It is concluded that the microbial count in water bodies has been reduced periodically after immersing the flowers in water bodies. It is also evident that different pathogenic microorganisms are present in potable water sample.

It is also concluded that the flowers and leaf extracts of bathukkamma used flowers are having varied anti-microbial property which was concluded by Zone of inhibitions on Gel diffusion assay.

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