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Full Length Research Article

THE MYSTERIOUS BLUE BEHIND THE BRIGHT AND RED WATER MELONS AN EMPIRICAL STUDY WITH SPECIAL REFERENCE TO TAMIL NADU ; CONSIDERING THE AWARNESS LEVEL OF THE GENERAL PUBLIC

***,[1]Mr. Anand Shankar Raja and [2]Mr. Mridul Umesh**

[1]Department of commerce, SRM University, Chennai, India
[2]Department of Microbial Bitoechnology, Bharathiar University Coimbatore, India

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ABSTRACT

Everyone is tempted towards red and juicy watermelons being sold in markets by roadside vendors. But beware of extra redness you see in these watermelons. According to health experts, there is indeed something suspicious behind the sheen. Melons are a popular fruit of summers though its demand decreases after the arrival of mangoes. Yet this fruit tempts every passer-by because of its attractive shape and colour. But before you buy this red goodie, think twice as this redness may not be good for heath. "Most of the watermelons being sold in the market are very red and juicy. But one must remember that watermelons become sweeter only after 'loo' starts hitting the region. As loo is still not blowing over the state how these melons have turned so red and juicy," said an official of food and drug department. The question of whether people are aware about this adulteration is to be analysed and a general suggestion has to be given, thus the paper intends to cope with the study objectives.

INTRODUCTION

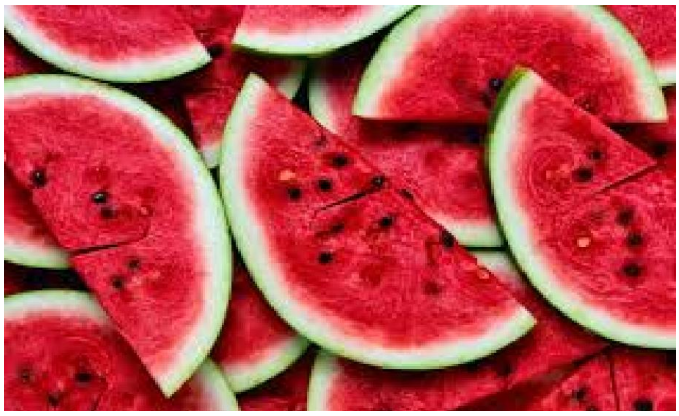
Africa is the original home of watermelon, and the fruit has likely existed since pre-historic times in the regions known today as Namibia and Botswana. Indeed, it's an ancient fruit with deep roots in history—according to the book, "High-Tech Micro propagation," remnants of the fruit were found as hieroglyphs on Egyptian tombs over 4,000 years ago. Watermelon seeds were also found in a cave in Hang-Zhou, China circa 3,000 BC. When and how watermelon arrived to India is not precisely known, though the fruit likely existed there since ancient times, even before it migrated to China. Come summer, one is inexorably drawn to cool, juicy fruits piled up in markets and by the roadside. Popular among these is the watermelon, which tempts every passer-by largely because of its luscious plump redness. Before you make a beeline for this succulent fruit, stop! for its red allure could spell danger. it could be artificial. Since consumers prefer ripe, bright-red melons, they often ask the fruit vendor to cut a small piece of the fruit and show them the inside before buying.

Corresponding author: Mr. Anand Shankar Raja,
Department of commerce, SRM University, Chennai, India.

So sellers have found a method to sell their entire stock: they have apparently started injecting a red dye into the fruit to give it a bright red shade. Such colours could be toxic and many a time result in deadly diseases. Following complaints of artificial colouring of watermelons, the my sore City Corporation and food and civil supplies department staff have started lifting fruit samples at regular intervals to test them for the presence of any artificial dye. Most of the watermelons being sold in markets nowadays are ripen by artificial methods. Vendors offer bright red pieces of melons to consumers who buy the same without even thinking of its adverse effects. According to the health experts, vendors have apparently started injecting a red dye into the fruit to give it a bright red shade. These colours are toxic and may cause deadly diseases. 'A spurious red colour injected into watermelon gives it an attractive shade. Even the round shape can be an indicator for buyers as most of them have been ripen by exposing to carbide that generates ethylene gas which gives out heat that in turn helps the fruit to ripe fast and in proper shape,' said the FDA Official. This pernicious practice of using harmful colours in foods to simply make food look attractive, is not restricted to watermelons alone.

Even vegetables are not spared. Lady-fingers, pumpkin, brinjal are also adulterated. Apart from poor enforcement of the Prevention of Food Adulteration Act, the consumer's ignorance is the bigger apathy which allows adulterators to get away with such practices.

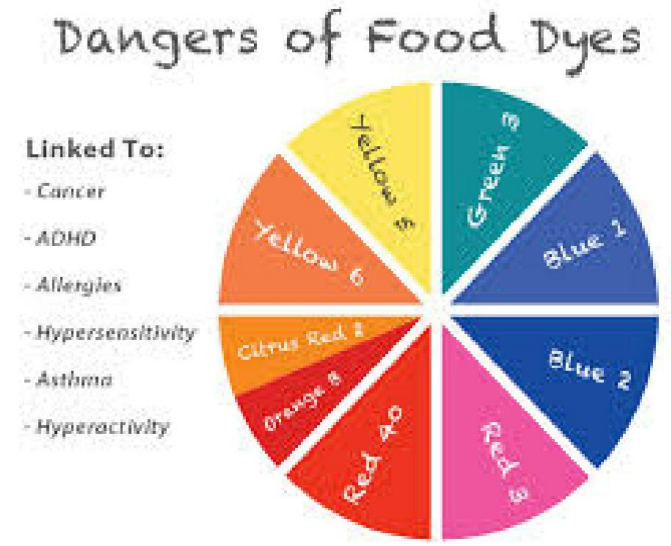
"In fact, during summers, it is not just the watermelon that is infused with red colour. Since vegetables tend to dry up quickly, they are also given a coating of colour to make them look fresh," According to the expert, the colours used in artificial ripening of fruits and vegetables includesudan red, methanol yellow and lead chromate. "Carbide which is used to ripen the fruit is harmful for liver and kidney, while methanol yellow can cause cancer, stomach ailments and degeneration of the male reproductive organs. Lead chromate can cause anaemia, brain damage and blindness. Whereas, sudan red is also harmful for stomach and digestion,"



Review of Literature

Synthetic dyes are a common pollutant in effluents from textiles, rubber, paper and pulp industries. These dyes are difficult to degrade due to their complex aromatic structures, persist in the environment, pollute the water bodies and affect aquatic life and enter into food webs and have carcinogenic and mutagenic effects (Sharma *et al*., 2005; Tahir *et al*., 2008; Vinoth *et al*., 2010; Abbas *et al*., 2011; Karthik *et al*., 2012). Majority of these dyes are azo dyes which are bright in colour due to the presence of one or several azo (–N=N–) groups associated with substituted aromatic structures **(**Vinoth *et al*., 2010). The continuous intake of dye incorporated fruits can cause the ADHD (Attention Deficit Hyperactivity Disorder) commonly in children. The major dyes like yellow 5 and 6, Red 40 are the major threat to American population due to its potential role in inducing hepatocarcinogenicity (Milton 2010). These contain the benzidine and 4 aminobenidyl compound related to cancer proliferation. The role of food colourants and injectable fruit dyes in causing health hazards are still not fully studied.

The major effects include genotoxicity, neurotoxicity, and carcinogenicity. Genotoxicity involves the potential of a injectable dye to cause major mutation or chromosomal aberrations that may leads to severe genetic disorders that may be inherited even after several generations (Senoo *et al*., 1974). Certain injectable dyes like 4- amino biphenyl and 4 aminoazobenzene cannot be detected by usual laboratory test but ate potential agents in inducing liver and pancreatic cancers once consumed for a long time due to their ability to release free radicals (Hansen, 1964). Neurotoxicity by dyes is initiated by its synergistic effect on neural development (Lau *et al*., 1964). The other adverse effects caused by injectable dyes includes reproductive toxicity and teratogenicity (Borzelleca *et al*., 1987)



Chemicals used for ripening the fruit and its negative health effects

According to doctors and nutritionist, the lethal chemicals that are used illegally for artificial ripening of fruits and vegetables could cause deadly diseases. Chemicals used in ripening the fruit include carbide, lead chromate, methanol yellow and Sudan red.

- **Carbides** are composed of a carbon atom fused with a less electronegative atom, commonly used for ripening of fruits. It causes severe damage to liver.
- **Lead chromate** a yellow coloured chromate salt of lead is used in fruit based food stuffs for attraction and appearance. It can cause anaemia, blindness and brain damage.
- **Methanol yellow** is a derivative of triphenyl methanol and cause stomach ailments, cancer and degeneration of the male reproduction.
- **Sudan red** is a yellowish red lysochrome azo dye that can cause digestion problems and is harmful for stomach.

Objective of the study

- The ultimate objective of the present study is to determine the mysterious blue behind the bright and red water melons an empirical study with special reference to Tamil Nadu; considering the awareness level of the general public
- To determine the various factors which motivate the consumers to buy red natured water melons
- To create general awareness about water melon adulteration to the general public.
- To understand the nature and type of the dyes used in fruits with special reference to watermelons.
- To study the mode of metabolism of the dyes in human body and its potential health hazards.
- To assess the opinion and awareness of common people regarding the potential adulteration of fruits with dye contaminants and their health risks.

MATERIALS AND METHODS

The present study is empirical in nature based on both primary and secondary data. The data was collected through a structured questionnaire. The study has been conducted in in all the cities in Tamil Nadu state. The sampling technique used was non-probability based convenient sampling. The study was carried out on 600 respondents. The data was collected from respondents personally and via emails in the month of September 2014 to March 2015. The data has been analyzed Multivariate with the help of SPSS version 20.0 statistical package.

Table 1 highlights that Characteristic of the respondents. The total numbers of the respondents were 600, out of which 408(68%) were male and 192(32%) were females. Majority 228(38%) were in the age group of 26-35 years, followed by 180(30%) were in the age group of up to 25 years, 120(20%) in the group of 36-45 years and 72(12%) in the age group of above 46 years. In connection with educational qualification of respondents, 233(38.80%) of respondents were under graduates, 182(30.30%) respondents were post graduates, 116(19.30%) respondents were up to HSC qualified and 69(11.50%) respondents were professionals. Occupations wise, 326(54.33%) of respondents were salaried, 172(28.67%) respondents were business and 102(17%) of the respondents were professionals. Total monthly income wise, majority 228(38%) of the respondents were in the income group of Rs.20, 001 – 40,000, 181(30.20%) of the respondents were in the income group of below Rs.20, 000, 117(19.50%) were in the income group of Rs.40, 001 -60,000 and 74(12.30%) of the respondents were earning more than Rs.60, 000 per month.

Table 1. Characteristics of Respondents

Gender	Frequency	Percentage
Male	408	68.00
Female	192	32.00
Total	600	100.0
Age		
Below 25 years	180	30.00
26 – 35 years	228	38.00
36 – 45 years	120	20.00
Above 46 years	72	12.00
Total	600	100.0
Educational Qualification		
Up to HSC	116	19.30
UG	233	38.80
PG	182	30.30
Professional	69	11.50
Total	600	100.0
Occupation		
Professional	102	11.50
Salaried	326	54.33
Businessman	172	28.67
Total	600	100
Monthly Income		
Below Rs.20,000	181	30.20
Rs.20,001 – Rs.40,000	228	38.00
Rs.40,001 – Rs.60,000	117	19.50
Above Rs.60,001	74	12.30
Total	600	100.0

Source: Computed data

Food adultration even in fruits?

Food adulteration has turned to be a serious concern effecting the overall health of the population ranging from metabolism, reproductively, neurological and genetic feature of an individual. Dyes are complex organic compounds that are synthesized from coal tar and now petroleum products. They are widely used in the food industry because of their inexpensive nature as compared to their natural derivatives. It really arises a question 'How far the fruits are healthy?'. Incorporation of dyes in to fruits is to increase the cosmetic appearance of the fruits to attract the people who pay more attention to the external features rather than the ultimate nutritious content.

Ripening of fruits is an irreversible process accompanied by a sequence of physiological and biochemical changes that makes the fruit edible, palatable and nutritious. Natural ripening involves the gradual changes to the fruit that makes the fruit to change in colour, to gain a cosmetic appearance, soften its texture, to get aroma and characteristic flavour. Synthetic injectables dyes added to the inner core of the melons only improve the appearance of the jelly sap leaving behind their characteristic nutritive content and organoleptic properties. The condition becomes much worse when chemical injectables are used without considering the maturation period of the melons. The rush behind global consumerism has clearly ruined the principle and strategies that were once the foundation of food safety and health food habits. Fruits once regarded as the ultimate source for all vital nutrients in balanced quantities are now being viewed as agents that carry an appreciable amount of non detectable toxins in the form of dyes.

Intrepretation

From the above table it is clear that most of the consumers (71.67%) purchase water melons due to its attractiveness and 71.62 % are attracted towards price and quantity were it is clear that consumers are not taking into consideration quality of the fruit.83% of the consumers are aware of the health issues were 87% of the consumers check for purity before the purchase behaviour.

Table 2. Features Considered for buying watermelon

Features Considered for Buying Red coloured water melons	Yes	No		Total
Sweetness & juicy content	303 (50.5%)	297	(49.5%)	600 (100%)
Attractive	170(28.33%)	430	(71.67%)	600 (100%)
Quality	459(76.5%)	141	(23.5%)	600 (100%)
Attitude	247(41.17%)	353	(58.83%)	600 (100%)
Satisfaction Price and quantity	170(28.33%)	430	(71.62%)	600 (100%)

Table 3. Awareness level on various aspects related to purchase of water melons

S.No	Variables	Yes		No	Total
1	Checking of purity	527	(87.8 %)	73 (12.2 %)	600 (100%)
2	Aware of adulteration	347	(57.8 %)	253(42.2 %)	600 (100%)
3	Aware of market Price110	501	(83.5%)	99 (16.5%)	600 (100%)
4	Aware of news on artificial content	367	(61.2%)	233 (38.8%)	600 (100%)
5	Aware of health issues	500	(83.3%)	100 (16.7%)	600
6	Aware of dye content		64 (10.7%)	536 (89.3%)	600
7	Awareness on consumer movement	331	(55.2%)	269 (44.8%)	600
8	Awareness of global adulteration		38 (6.3%)	562 (93.7%)	

Conclusion

The usage of non-authentic substances in food items is strictly prohibited under the Indian law and the same applies to export oriented units. Any violation of the provisions of FSS Act/Rules & Regulations is liable for penalties and may invite prosecution. Our food testing laboratory is equipped with all the required equipment and is operated by a team which is experienced in the analysis of food adulteration, using techniques like HPLC, HPTLC, GCMC, LCMSMS and chemical analysis. We have been routinely carrying out this analysis for leading packaged food, FMCG and retail organizations in India for compliance to the FSS Act/Rules & Regulations. From the above analysis it is clear that though people are aware of the health issues they involve into purchase behaviour. It's the duty of the consumers to get aware and to save their health. Fresh produce beckons us with its vivid colours and organic shapes, brightly colored packages and images seek to draw our eyes to those brands instead of competitors, and countless products are colored with bright synthetic dyes that turn unattractive mixtures of basic ingredients and food additives into alluring novelties. The prevalence of dye contaminated food in markets is a clear cut evidence of deeper malaise in the food regulatory regime. Instead of tackling adulteration and the issue of food safety, the authority appears preoccupied with issues connected with the packaged food industry. It is high time that the food regulator tightened its belt.

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