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Detection of nitrite and sulphate residues in vegetables grown at Tapti river basin in Burhanpur city (Madhyapradesh) India

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Abstract
Nitrate and sulphate is the chemical that may cause pollution. The aim of present work was to detect the residues of nitrite and sulphate in vegetables which grow in Tapti river basin in Burhanpur city. In March 2015 to July 2015, forty samples were collected from Market (Badi Mandi) and from beside Tapti river land, which land is used for fertilization of crops and Tapti river water is used for irrigation purpose. It was observed that, the nitrite concentration 39-50 mg/kg was observed in spinach which is higher as compared to watermelon, cucumber and Brinjal. The sulphate concentration 74.4-92.4 mg/kg was observed in Brinjal which is higher as compared to spinach, cucumber and watermelon. In all over the values of nitrite and sulphate in vegetables which grow near Tapti river basin are higher than the vegetables which are taken from Market (Badi Mandi).

Keywords: Tapti River, Vegetables, Residues- Nitrite & Sulphate etc.

1. Introduction
Pollution issue is now among the most important issues that the world countries are interested in since this issue has a great effect an all life aspects and causes great threaten to plants environment and human health. The pollution problems range up after the industrial revolution. Nitrate and sulphate are chemicals that may cause pollution.
Tapti River flow from east side of Burhanpur city which is originated from Multai in Betul district. Burhanpur is a city (Dist.) in Madhya Pradesh state of India. Tapti is a major river of West Coast river system of India with total length of 724 km. Tapti River is an important water source for Burhanpur district. Water is contaminated by Clothing, Bathing, washing, and dumping ashes and other recreational activity and disposal of sewage and industrial waste. Panda rol nala a waste water drain runs through the heart of the city is also goes to Tapti River near the small bridge. Huge amount of waste water is produced in the city due to the increasing population. The indiscriminate disposal of such sewage and industrial waste water cause soil and water pollution. However, the waste water has been used in agriculture as a source of irrigation.
The acceptable daily intake of nitrite and nitrate set by European commission scientific committee for food is 3.7 mg/kg body weight of nitrate (Ministry of Agriculture, 1994). An estimated daily dose of nitrate 75-100 ng consumed by man, from which 80-90% comes from vegetable and 5-10% comes from water (Tannenbaum and Wastra, 2000) [2]. The high concentration of nitrate in water leads to as 'Eutrophication' which mean an excessive growth of the algae and micro-organism in water bodies which consume the oxygen gas dissolved in water causing the death of fishes in that area. Drinking water and vegetable are the major source of nitrate consumed by human stomach. But unaffected High solubility of nitrate in water and its low retention by soil particles make it major component the use of ground water for drinking and causes a number of health diseases (Mounen J.M. *et. al.*, 1998, Umah *et. al.*, 2003) [3, 11]. The nitrate ion concentration is very important in public water supplies, because if it exceeds more than 45 mg/l, it causes blue baby diseases (Methemoglobinemia) in children. (Bhadram *et. al.*, 2004) [12].
The main source of nitrate mixes in to the river which comes from the waste water of industries and city drainage. Increasing population and inflation people grow crops of

vegetable and fruits beside Tapti River and Panda Rol nala water which is used for irrigation purpose. At those places elements are assimilated and deposited. When these crops grow beside Tapti basin these elements are assimilated by plants and deposited in leaves and fruits. When such contaminated vegetable and fruits are consumed liable to get some problems associated with excessive consumption of these factors. Rousta *et al.*, in 2010 [5] reported that Nitrate content in cucumber was 5.8 times higher than standard. vegetables are the major source of the daily intake of nitrate by human beings supplying about 72-94% of the total intake part of this nitrate - N is converted to nitrate and N - nitroso compound that have detrimental effect on human health (Gupta *et. al.*, 2008) [6].

2. Material and Methods

Collection of Sample

Four types of vegetable Cucumber, Watermelon, Brinjal and Spinach were collected for this study. These crops are the most common cultivated crops in Burhanpur district. In 2015 March to July forty samples were collected from Market (Badi Mandi) and beside Tapti River land, which is used for fertilization of crops and Tapti River water is used for irrigation purpose.

Nitrite and Sulphate extraction

A fifty gram sample of the prepared crop was blended with 50ml distilled water in home blender. The mixture was filtered through whatman no.2 filter paper and the filtrated was passed through glass column fitted with a tape and filled with activated alumina in order to separate the green colour (Chlorophyll) and get a transparent solution. Water was used as eluting solvent. The eluted solution filtered using 0.45um filter paper in order to eliminate the turbidity and get a clear solution.

Quantitative determination of nitrite

With the AOAC official method 973.31 a portion of solution containing nitrite was transferred in to a 25 ml volumetric flask. Then 2.5 ml sulfanilamide was added, followed by addition of 2.5 ml NAD. The volume was completed with water and left for 15 minutes in order to give time for colour development. The absorbance was measured at 545 nm against a blank solution. The nitrite concentration prepared as follows 10, 20, 30 and 40 ml of nitrite working standard solution were transferred in to 50 ml volumetric flasks in order to prepare standard solution of 0.2, 0.4, 0.6 and 0.8 ppm $NaNo_2$ (Sodium Nitrite). Then add 2.5 ml NAD (N-(1-naphthyl) ethylene diamine) regent. The volume was completed to the marks. The absorbance was measured after 15 minutes at 545 nm.

Quantitative determination of sulphate

i. In to 50ml filtered sample 10ml of Nacl Hcl solution, 10ml glycerol ethanol solution and 0.15gm barium chloride was added the mixture was stirred for about 1hrs. (Magnetic stirrer was used)
ii. The absorbance at 420nm on spectrophotometer simultaneously running distilled water blank.
iii. The sulphate value was recorded directly from the standard graph standard dilution prepared.

3. Result and Discussion

Table 1: Number of Samples collected from Market and beside Tapti River

S. No.	Vegetables and Fruits	From Market	Beside Tapti River
1	Cucumber(Cu)	05	05
2	Watermelon(Wm)	05	05
3	Spinach(Sp)	05	05
4	Brinjal(Br)	05	05

Table 2: Nitrite Determination in Watermelon (Wm) (mg/Kg)

S. No.	Sample from Market	Nitrite mg/Kg	Samples beside Tapti River	Nitrite mg/Kg
1	MWm_1	9	TWm_1	21
2	MWm_2	11	TWm_2	24
3	MWm_3	5	TWm_3	15
4	MWm_4	6	TWm_4	20.1
5	MWm_5	10	TWm_5	23
Mean		8.2	Mean	20.62

Table 3: Nitrite Determination in Cucumber (Cu) (mg/Kg)

S. No.	Sample from Market	Nitrite mg/Kg	Samples beside Tapti River	Nitrite mg/Kg
1	MCu_1	4.0	TCu_1	19
2	MCu_2	3.0	TCu_2	20.25
3	MCu_3	3.5	TCu_3	21.0
4	MCu_4	2.5	TCu_4	45.25
5	MCu_5	3.0	TCu_5	32.75
Mean		3.2	Mean	27.65

Table 4: Nitrite Determination in Spinach (Sp) (mg/Kg)

S. No.	Sample from Market	Nitrite mg/Kg	Samples beside Tapti River	Nitrite mg/Kg
1	MSp_1	20	TSp_1	50
2	MSp_2	25	TSp_2	44
3	MSp_3	22	TSp_3	39
4	MSp_4	24	TSp_4	49
5	MSp_5	23	TSp_5	45
Mean		22.8	Mean	45.4

Table 5: Nitrite Determination in Brinjal (Br) (mg/Kg)

S. No.	Sample from Market	Nitrite mg/Kg	Samples beside Tapti River	Nitrite mg/Kg
1	MBr_1	5	TBr_1	39
2	MBr_2	10	TBr_2	37
3	MBr_3	10	TBr_3	40
4	MBr_4	11	TBr_4	39.5
5	MBr_5	09	TBr_5	42
Mean		9	Mean	39.5

M = Market, T= Beside Tapti River

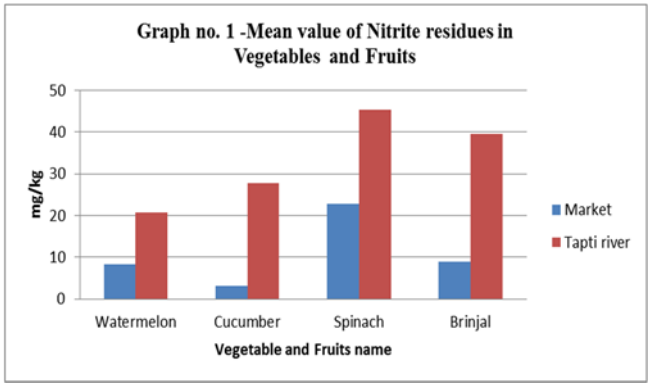


Table 6: Sulphate Determination in Watermelon (Wm) (mg/Kg)

S. No.	Sample from Market	Sulphate mg/kg	Samples beside Tapti River	Sulphate mg/kg
1	MWm_1	10	TWm_1	22.4
2	MWm_2	12.3	TWm_2	34.4
3	MWm_3	8.4	TWm_3	14.4
4	MWm_4	18.9	TWm_4	30.4
5	MWm_5	20	TWm_5	34.4
Mean		13.92	Mean	27.2

Table 7: Sulphate Determination in Cucumber (Cu) (mg/Kg)

S. No.	Sample from Market	Sulphate mg/kg	Samples beside Tapti River	Sulphate mg/kg
1	MCu_1	10	TCu_1	27
2	MCu_2	13	TCu_2	30
3	MCu_3	18	TCu_3	44
4	MCu_4	20	TCu_4	43
5	MCu_5	10	TCu_5	40
Mean		14.2	Mean	36.8

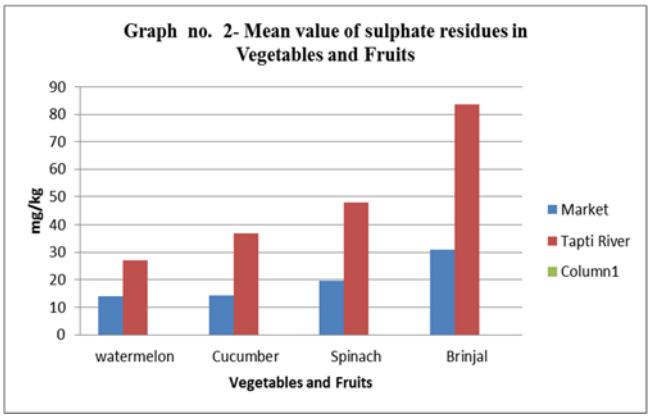
Table 8: Sulphate Determination in Spinach (Sp) (mg/Kg)

S. No.	Sample from Market	Sulphate mg/kg	Samples beside Tapti River	Sulphate mg/kg
1	MSp_1	25	TSp_1	48.5
2	MSp_2	21.8	TSp_2	49.0
3	MSp_3	15	TSp_3	44.4
4	MSp_4	16.5	TSp_4	46.9
5	MSp_5	20	TSp_5	50.0
Mean		19.66	Mean	47.76

Table 9: Sulphate Determination in Brinjal (Br) (mg/Kg)

S. No.	Sample from Market	Sulphate mg/kg	Samples beside Tapti River	Sulphate mg/kg
1	MBr_1	25.8	TBr_1	90.4
2	MBr_2	30	TBr_2	74.4
3	MBr_3	54	TBr_3	84.4
4	MBr_4	25	TBr_4	92.4
5	MBr_5	20.5	TBr_5	76.4
Mean		31.06	Mean	83.6

M = Market, T= Beside Tapti River



According to Rezaei *et al.*, (2014) [8], nitrite concentration in watermelon marketed in Arak, Iran, shows that 3.1 to 8.5mg/kg. In our study it is observed that, the values of nitrite concentration in watermelon which is grow Tapti River in the ranged of 15-24mg/kg and is greater than the watermelon which is taken from market whose nitrite concentration are in the range of 5-11mg/kg. In case of Cucumber which grow beside Tapti River nitrite concentration was in the range of 19.0-45.25mg/kg and taken from market which concentration was in the range of 3-4.0 mg/kg (See Table no 1 to 4). According to U.K. Ministry of Agriculture Fisheries and Food (1992) [9] & Anonymous (1993), the value of nitrite in cucumber 3 mg/kg, spinach 26 mg/kg, In Arak Market in Iran, nitrite value in cucumber shows that 2.8-18.5 mg/l (Rezaei *et al*, 2014) [8]. Above observation shows that higher the residues of nitrite in Cucumber and spinach which grow beside Tapti River. In case of Brinjal also shows that which grow beside Tapti River land which was nitrite value was in the range of 37-42 mg/kg greater than the Brinjal which is taken from market that is 5-11 mg/kg.

The value of sulphate in watermelon which grows beside Tapti River land was in the range of 14.4 - 34.4 mg/l which values are greater than the watermelon taken from main market the values was in the range of 8.4-20 mg/kg. In case of cucumber also shows in value of sulphate in cucumber which grow beside Tapti River was in the range of 27-44 mg/kg and in greater than the cucumber which was taken from market. The sulphate values in Spinach and Brinjal which grow beside Tapti River was in the range of 46.9-50 mg/kg, 74.4 - 92.4 mg/kg respectively is greater than the Spinach and Brinjal which is taken from market 15-25 mg/kg, 20-31.6 mg/kg values are in the range of respectively. (See Table no 5 to 8)

4. Conclusion

The vegetables grow beside water reservoir of Tapti River (residues) of nitrite and sulphate which are having very high alarming level of the residues. Although it is a very good source of water and highly fertile land therefore if yields good quality and quantity of fruits and vegetables but this is very dangerous for public health.

These days more accumulation of nitrite in the soil is more common due to chemical fertilizers and there are causing many problems in the society. The above experiment in lightness us about indiscriminate use of chemical fertilizers and irrigation with polluted water. The Farmers should to avoid growing crops which such polluted reservoirs.

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