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Proximate composition of pumpkin (*Cucurbita pepo*) irrigated with municipal waste water of Sargodha city

Abdul Ghani, Irfan Mustafa, Asif Abbas Shah, Tahir Islam and Iftikhar Ahmed

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Abstract: *Cucurbita pepo* belongs to family *cucurbitaceae*. It is a fruit vegetable, seasonally used in Sargodha and other parts of Punjab. The proximate analysis is the most generally used analytical scheme of analysis. Two sites, the Ajnala road and Sillanwali road subjected to canal and sewage water application were selected for sample collection. Samples for Proximate analysis were obtained in the form of grains of *C.pepo* from three different places of each site. During the study it was concluded almost all the parameters of proximate analysis were higher in wastewater irrigated sites as compared to canal water sites.

Keywords: Sargodha city, Ajnala road, Sillanwali road, *Cucurbita pepo,* proximate analysis.

Introduction

Application of wastewater effluents for irrigation has been practiced for centuries throughout the world (Shuval *et al.,* 1986; Tripathi *et al*., 2011). The use of industrial or municipal wastewater in agriculture is a common practice in most parts of the world (Urie 1986; Blumenthal et al. 2000; Ensink et al. 2002; Sharma et al. 2007). Sargodha being the Divisional Headquarters since 1960 of Punjab province of Pakistan, has earned many titles such as the "*City of the Brave",* the *"Kino Capital of the World",* and the "*California of Pakistan"*, The urbanization regarding to the Sargodha city is in haphazard manner. Available service mechanism for waste management, sewerage and water supply sanitation is out of proportion to the need of existing population. The sewage material and municipal wastes propelled by windy and dry climate of the Sargodha city can be seen scattered in major streets and roads. The untreated wastewater results in aesthetic problems and pollutes the water resources as it infiltrates into the ground (Aina *et al.,* 2005; Khan *et al*., 2009).

Cucurbita pepo (pumpkin) is included in *Cucurbitaceae* family. Pumpkin is such a vegetable that is renowned as "Petha Kaddu" in local language by the people of Sargodha, Pakistan. It is also a useful vegetable however, it is a fruit vegetable. This is vine-like crop which usually covers 10m area in length. It is mainly propagated from seed. Seed conservation of this crop is not properly managed. At planting time seeds supply is affected due to some reasons: (i) losses of mature ripened ovary after harvest and (ii) early use of immature fruits for edible use. The study was carried out keeping in view the importance of this vegetable in local market.

Silanwali road area is a biggest industrial area in North West side of Sargodha. This is a mix type of industrial cluster, predominantly having Rolling mills, foundries, cotton mills, biscuits factories Chemical, Textile processing, vegetable Oil refineries tyre and plastic shops, conjusted residential areas, flour mills, vehicular places and other small scale industries and factories. On the Silanwali road, the wastewater runs to the agricultural fields through 'Ganda Nala Chak No. 79 N.B' alongside the canal Lower Jehlum. Ajnala Road area is towards the north side of Sargodha city. Initially this area was outside of the city. Gradually by civilization this area is becoming full of residential and commercial activities. It is named after a well known town "Ajnala" located about 12 Km away from the main city. The agricultural fields along this side are irrigated with canal water through "Rajbah Mitha Lak". The objectives of the study were to ascertain the proximate composition of leafy and root-forming vegetable crops found in the sub-urbane area of Sargodha with the view of documenting and exploiting them as alternative sources of protein, fat and fiber for the emerging population in this area.

Abdul Ghani, Irfan Mustafa, Asif Abbas Shah, Tahir Islam, Iftikhar Ahmed
Department of Biological Sciences, University of Sargodha, Pakistan

Materials and Methods

Detection of Ash: 1g of oven dried sample of vegetables was taken in china dish and burnt the sample in burner till that became smoke free. Then the sample was ignited in muffle furnace at 600°C till white grey ash was obtained.

The values of ash were determined by applying the following formula;

$$\text{Ash \%} = \frac{\text{weight of ash}}{\text{Weight of sample}} \times 100$$

Detection of Moisture Contents: 5g dried sample of grains of vegetables were taken in a china dish and put that in hot air oven at 105°C for 24 hours. After that they were placed that in desicator, weighed the sample and repeated the procedure after 2 hours till constant weight was obtained. The contents of moisture was also detected by applying the following formulae

$$\text{Moisture amount} = \frac{\text{weight of sample before drying-weight of sample after drying}}{\text{Weight of sample after drying}} \times 100$$

Detection of Crude Fat: For determination of crude Fat, Soxhlet apparatus was used. 2g of dried sample were takent in thimble. Thimble was then fitted in Soxhlet apparatus and fat in flask was obtained.

Detection of Crude Protein: 1g of dried sample was taken in a flask and 5g of digestion mixture (K_2SO_4, $FeSO_4$, $CuSO_4$) was added in the flask. Then 25ml H_2SO_4 was added and heated till transparent material was obtained. Distilled water was added to make it dilute. 10 ml of this sample was taken and distilled it with 50 mg of zinc and sodium hydro oxide. Methyl red was used as indicator and titrated it with sulphuric acid ($H_2SO_{4)}$ until light pink color appeared. The amount of acid used shows the amount of protein. Micro-Kjeldahl apparatus was used for this purpose.

Detection of Crude Fiber: Crude fibers were determined by using the method of acid base digestion. 3g of oven dried sample was taken andfat was removed by Soxhlet apparatus and sample was digested in 1.25% H_2SO_4 and NaOH separately. Then contents were filtered and the material was washed three times by using distilled water. Then residue were transferred in china dish and placed in oven at 105°C for 24 hours. Then the residue was ignited in muffle furnace at 600°C to obtain ash. Crude fibers were measured from the ash. The difference between the weights of the sample was the contents of crude fibers.

Detection of dry matter: The contents of dry matter was detected by applying the formula

Dry matter in percentage= 100 - moisture amount

Detection of NFE: The amount of NFE was detected by using formulae

NFE% = 100-(CP+MM+Fat+Fiber)

Results and Discussions

Ash Contents: There was a significant effect ($P<0.05$) of canal and sewage water on ash contents in *C.pepo* at all the sub-sites 1(Table 1). Mean ash contents percentage ranges from 1.5-1.8 % (Figure 1) in all the canal water treated plant at all the three sub-sites while its range in sewage water treated plants varied from 2.3 to 3.09 %. The highest mean ash concentrations in *C.pepo* was observed in Sillanwali road at SS-2 (Figure 1) and lowest absorbance was noticed in Ajnala road area at SS-1 (Figure 1). Ash content observed in the present study showed higher values at sewage water irrigated sites as compared to canal water irrigated ones. In grains ash contents investigated during our study was lower than the findings of Adebowale (2007) who found the critical value of 10.70 % in different species of forages. These values were also lower than the values already demonstrated by Pearson (1976).

Moisture Contents: The effect of all the three sub-sites of respective sites showed significant ($P<0.05$) result

Table 1: Analysis of variance for Ash, Moisture, Dry Matter, NFE, Crude fat, Protein and Crude Fiber concentrations in vegetable varieties at different water treatments.

Source of Variation (S.O.V)	Degree of Freedom (df)	Mean Squares	
		Ash concentration	
		Canal	*Sewage*
Sub-sites	2	.070*	.120**
Error	6	.010	.010
		Moisture contents	
Sub-sites	2	.443***	.570***
Error	6	.019	.010
		Dry Matter	
Sub-sites	2	214.530***	.088**
Error	6	6.010	.014
		NFE	
Sub-sites	2	10.352***	.056**
Error	6	.010	.014
		Crude fat	
Sub-sites	2	.334**	.591***
Error	6	.014	.023
		Protein	
Sub-sites	2	.160*	.241*
Error	6	.030	.038
		Crude Fiber	
Sub-sites	2	3.213***	.721***
Error	6	.019	.009

*** = significant at 0.001 levels
** = significant at 0.01 levels
* = significant at 0.05 levels
ns = non significant

on *C.pepo* moisture contents regarding canal and sewage water applications (Table 1). Moisture contents of forages ranged from 3.8-4.233333 % (Figure 2) in all the canal water treated plants at all the three sub-sites while its range in sewage water treated plants varied from 5.3 to 6.6 %. The highest mean moisture contents in *C.pepo* were observed in Silanwali road at SS-1 (Figure 2) and lowest absorbance was noticed in Ajnala road area at SS-1 (Figure 2). The moisture concentration was lower than the critical values established by Ahmad et al., (2010) at all three sub-sites. The moisture content observed in the present study showed higher values at sewage water irrigated sites as compared to canal water irrigated ones.

Dry Matter: A significant effect (P<0.05) of canal and sewage water on dry matter contents in *C.pepo* at all the three sub-sites of respective sites was noticed (Table 1). Mean dry matter contents was in the range of 93.1-94.7% in all the canal water treated plants at all the three sub-sites while its range in sewage water treated plants varied from 95.9 to 96.3%. The highest mean dry matter contents 96.3% in *C.pepo* were observed in Sillanwali road at SS-3 (Figure 3) and lowest 93.1% absorbance was noticed in Ajnala road area at SS-1 (Figure 3). The dry matter contents observed in the present study showed higher values at sewage water irrigated sites as compared to canal water irrigated ones. These values were lower than the values already demonstrated by Ahmad et al., (2010) in Punjab, Pakistan.

Nitrogen Free Extract (NFE): A significant effect (P<0.05) of canal and sewage water applications on NFE contents in all the canal and sewage water treated plants of *C.pepo* at all the three sub-sites was noticed (Table 1). Mean NFE contents percentage was ranges from 72.6-74.12 % in all the canal and sewage water treated plants of *C.pepo* at all the three sub-sites of both the respective sites while its range in canal water treated plant varied from 72.6 to 73.3 % and in sewage water treated plants its range varied from 73.4 to 74.12% (Figure 4). The observed NFE concentration was lower than the critical values established by Ahmad et al (2010) with respect to both sites the NFE concentration observed in the present study showed higher values at Sillanwali road sites as compared to Ajnala road area sites.

Crude fat/Ether extracts (EE): Analysis of variance for EE showed significant effect (P<0.05) on canal and sewage water applications for *C.pepo* at all the three sub-sites of Ajnala and Sillanwali road areas (Table 1). Mean EE contents percentage range was from 3.666667-5.733333 % in all the canal and sewage water

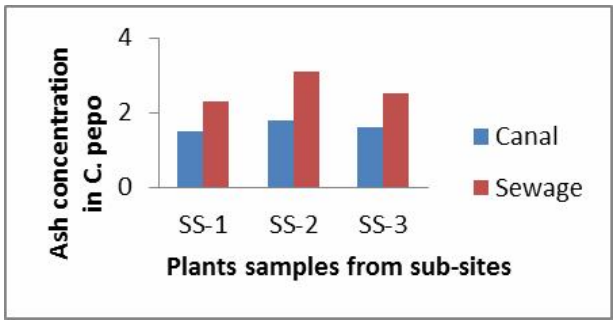

Figure 1: Variations in Ash contents of *C.pepo* under the influence of canal and sewage water.

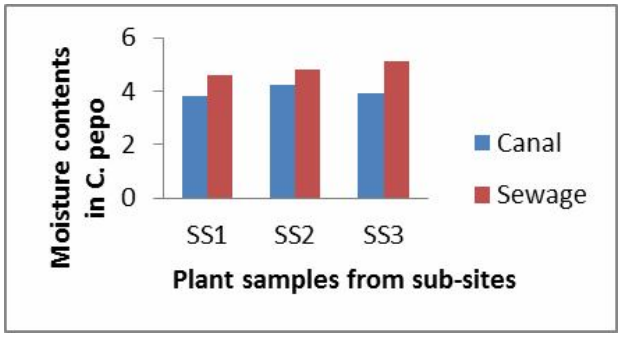

Figure 2: Variations in moisture of *C.pepo* under the influence of canal and sewage water.

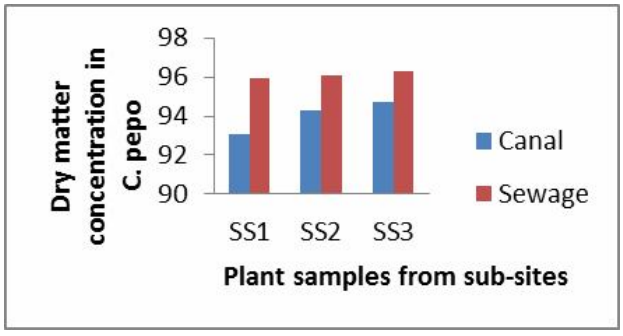

Figure 3: Variations in dry matter of *C.pepo* under the influence of canal and sewage water.

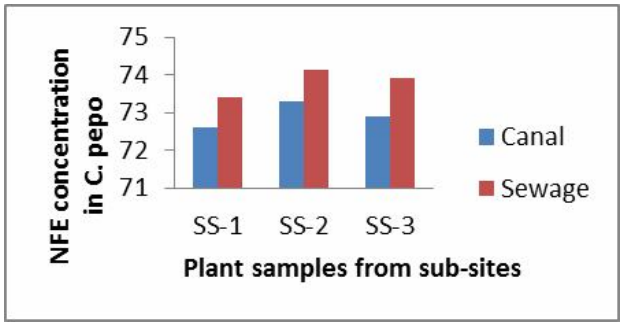

Figure 4: Variations in NFE contents of *C.pepo* under the influence of canal and sewage wate.

treated plants of *C.pepo* at all the three sub-sites of both the respective sites while its range in canal water treated plant varied from 3.666667 to 4.3 % and in sewage water treated plant its range varied from 4.866667 to

5.733333 (Figure 5). The higher value was observed at SS-1 of Sillanwali road area while lower value was at SS-3 of Ajnala road area (Figure 5). The ether extract concentration was lower than the critical values established by Ahmad et al., (2010). The EE contents observed in the present study showed higher values at sewage water irrigated sites as compared to canal water irrigated ones.

Crude Protein: A significant effect on Crude Protein was observed ($P<0.05$) on canal and sewage water applications for *C.pepo* at all the three sub-sites of Ajnala and Sillanwali road areas (Table 1). Mean Crude Protein contents percentage ranged from 18.06667-27.066667 % in all the canal and sewage water treated plants of *C.pepo* at all the three sub-sites of both the respective sites while its range in canal water treated plant varied from 18.066667 to 18.466667 % and in sewage water

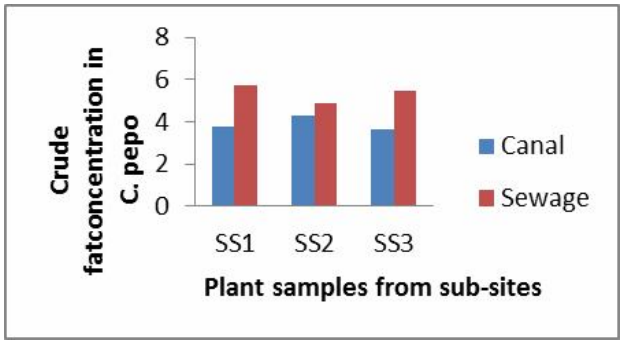

Figure 5: Variations in crude fat of *C.pepo* under the influence of canal and sewage water.

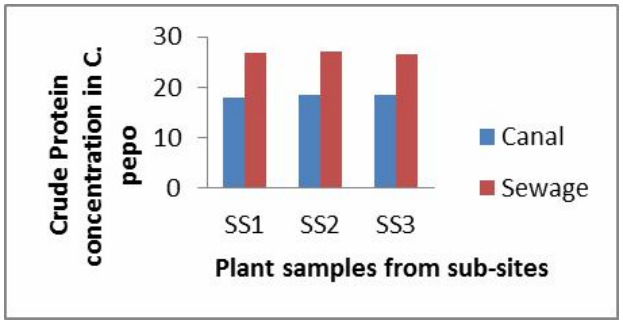

Figure 6: Variations in crude protein of *C.pepo* under the influence of canal and sewage water.

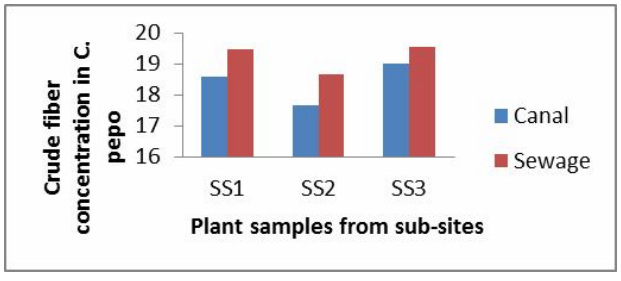

Figure 7: Variations in crude fiber of *C.pepo* under the influence of canal and sewage water.

treated plants, its range varied from 26.5 to 27.066667 % (Figure 6). The higher value was noticed at SS-2 of Sillanwali road area while lower at SS-1 of Ajnala road area (Figure 6). The Crude Protein contents observed in the present study showed higher values at sewage water irrigated sites as compared to canal water irrigated ones. The Crude Protein concentration was lower than the critical values established by Ahmad et al., (2010) at all three sites but greater than the values recommended by Adebowale (2007). The concentrations found during present findings were also slightly greater than the value given by Faruq (2002).

Crude Fiber: Crude fiber contents differed significantly ($P < 0.05$) between all the three sub-sites of Ajnala and Sillanwali road areas during canal and sewage water applications for *C.pepo* (Table 1). The average percentage of crude fiber in *C.pepo* ranged from 17.671-19.54017% in all the canal and sewage water treated plants of *C.pepo* at all the three sub-sites of both the respective sites while its range in canal water treated plant varied from 17.671to 19.021 % and in sewage water treated plant its range varied from 18.65353 to 19.54017% (Figure 7). The higher value was noticed at SS-3 of Sillanwali road area while lower at SS-2 of Ajnala road area (Figure 7). The Crude Fibers concentration was in the range of the critical values established by Ahmad et al., (2010) at all three sub-sites and also the values recommended by Adebowale (2007).

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