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Minerals and Microbiological Quality of Organically and Conventionally Grown Vegetables

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ABSTRACT: Amaranthus, spinach and tomato were cultivated to study the effect of organic farming on minerals (Fe, Zn, Ca, Mg, N, P and K), microbiological quality and affect of nitrates on these vegetables in two seasons i.e kharif and rabi. Field experiments were laid out in randomized block design (RBD) with 4 replications, each of vermicompost (VC), farmyard manure (FYM), poultry manure (PM) and cowdung (CD) as organic manures with conventional fertilizers as control. Organic farming found to significantly increase Fe, Zn, Ca, Mg and P as soil that has been managed organically has more microorganisms, which produce many compounds that influence the plant to absorb more micronutrients from soil in amaranthus, spinach and tomato crops and conventionally grown amaranthus, spinach and tomato were found to contain significantly higher nitrates compared to organically grown crops.

Key words: Organic farming, organic manures, minerals, nitrates.

Organic farming is gradually increasing in popularity and now organic agriculture is practiced in almost all countries of the world and its share of agricultural land and farms is growing. The demand for organic food is steadily increasing both in developed and developing countries, with annual average growth rate of 20-25%. Organic farming is gaining wide attention among farmers, entrepreneurs, policy makers and agricultural scientists for varied reasons such as minimum dependence on chemical inputs (fertilizers, pesticides herbicides and other agrochemicals) thus safe guarding / improving quality of resources and environment. In order to deliver enhanced nutrition within a food-based system, it is necessary to increase the nutritional value of the food. By enhancing nutrient dense crops, severe deficiencies can be eliminated in developing countries. Hence, one of the ways by which this goal can be achieved is through natural method, possibly with organic farming. Keeping these aspects in view, the present study was undertaken at Post graduate and Research Center, Dept. of Foods and Nutrition, Acharya N.G. Ranga Agricultural University (ANGRAU), Rajendranagar, Hyderabad, Andhra Pradesh.

Materials and Methods

To study the effect of organic farming on mineral quality characteristics, nitrate content and soil quality of selected vegetables such as amaranthus, spinach and tomato crops in two seasons i.e kharif and rabi, field experiments were laid out at CRIDA (ICAR) Research farm in Randomized Block Design, RBD (Snedecor and Cochran, 1989) with 4 replications, each of vermicompost, farm yard manure, poultry manure and cow dung as organic manures with conventional fertilizers as control. Dry powders of amaranthus, spinach and tomato crops were analysed for ash, mineral content, and nitrates as per standard procedures (AOAC, 1992). Analysis was carried out in duplicates. Nutrient analysis was carried out on fresh weight basis.

Results and Discussions

Mineral content of organically and conventionally grown vegetables

Among the different organic manures applied, significantly higher ash content was found in spinach cultivated with vermicompost and tomato cultivated with vermicompost, farm yard manure and poultry manure compared to conventionally grown crop in both kharif and rabi seasons. The iron content of all three organically cultivated vegetables and Invitro iron availablity of amaranthus was found to be significantly higher compared to conventionally grown vegetables of both the seasons. Vermicompost application resulted in significantly higher zinc and calcium content in amaranthus, spinach and tomato among the various organic manures tested in both the seasons.

Table 1: Mineral content of organically and conventionally grown vegetables

S.No	Season	VC	FYM	PM	CD	Control	CD(0.01)
ASH							
Amaranthus	Kharif	2.69	2.49	2.54	2.48	2.20	NS
	Rabi	2.79	2.59	2.64	2.63	2.30	NS
Spinach	Kharif	1.53	1.43	1.49	1.39	1.13	0.02*
	Rabi	1.61	1.49	1.59	1.53	1.23	0.04*
Tomato	Kharif	0.20	0.20	0.20	0.20	0.16	0.01*
	Rabi	0.22	0.22	0.22	0.21	0.16	0.01*
IRON							
Amaranthus	Kharif	3.76	3.22	3.87	2.90	2.65	0.02*
	Rabi	4.67	3.80	4.77	4.12	3.55	0.02*
Spinach	Kharif	2.76	1.15	1.74	1.25	0.06	0.02*
	Rabi	3.66	2.05	2.64	2.15	0.96	0.02*
Tomato	Kharif	0.60	0.54	0.57	0.35	0.03	0.02*
	Rabi	0.67	0.64	0.67	0.45	0.38	0.02*
ZINC							
Amaranthus	Kharif	0.23	0.17	0.21	0.14	0.10	0.01*
	Rabi	0.26	0.20	0.23	0.16	0.12	0.01*
Spinach	Kharif	0.48	0.47	0.36	0.36	0.31	0.01*
	Rabi	0.51	0.38	0.50	0.40	0.34	0.01*
Tomato	Kharif	0.51	0.35[a]	0.43[a]	0.34[a]	0.27[a]	0.17*
	Rabi	0.55	0.39	0.47	0.38	0.31	0.02*
CALCIUM							
Amaranthus	Kharif	326.10	276.30	396.8	305.80	250.38	0.63*
	Rabi	327.75	302.83	397.25	307.68	251.88	34.48*
Spinach	Kharif	115.95	82.26	114.10	106.93	76.16	2.85*
	Rabi	108.23	83.81	115.65	117.50	77.71	2.93*
Tomato	Kharif	53.82	50.21	58.80	35.84	31.83	0.43*
	Rabi	55.50	51.75	60.33	37.39	33.39	0.31*
MAGNESIUM							
Amaranthus	Kharif	223.0	185.5	155	172.4	122.8	0.81*
	Rabi	224.5	187.1	156.8	173.9	124.4	0.81*
Spinach	Kharif	52.11	46.61	40.09	56.47	36.90	2.76*
	Rabi	53.66	48.16	41.64	57.89	38.45	2.79*
Tomato	Kharif	34.40	34.40	35.01	23.99	23.03	0.15*
	Rabi	35.95	35.95	28.24	25.54	24.58	NS

* Significant at P=0.01 level
NS – Not significant

Significantly higher magnesium content was observed in plots where vermicompost was applied to amaranthus crop, cow dung applied to spinach crop of both seasons and poultry manure application to tomato crop compared to other organic manures and conventional fertilizers (Table 1). The absorption of micronutrients such as iron and zinc from the soil was significantly influenced by the application of organic manures i.e., vermicompost, poultry manure, farm yard manure and cow dung. Soil that has been managed organically has more microorganisms, which produce many compounds that influence the plant to absorb more micronutrients from soil. It is also reported that substances such as citrate and lactate combine with the soil minerals and make them more available to plant roots. For iron, in particular, this is especially important because many soils contain adequate iron but in an unavailable form. The presence of these microorganisms explains the trend showing a higher mineral content of organic food crops (Stevenson and Ardakani, 1972, Allaway, 1975, Hader, 1986, Henis, 1986 and Mc Clintock, 2004)

NPK Content of organically and conventionally grown vegetables

Poultry manure application to amaranthus, spinach and tomato registered significantly higher phosphorus content among all the organic manures (Table 2). The increase in phosphorus content of organically grown vegetables may be attributed to increased availability of soil phosphorus due to the solubilizing effect of organic acids, which are produced from decomposing organic manures. Further, the organic manures also reduce the fixation of phosphorus and increase the available phosphorus concentration in soil for absorption resulting in increased content of phosphorus in all vegetables. Apart from this, the enzyme activity which may be higher in poultry manure treated plots, might have contributed to increased availability of phosphorus resulting in increased absorption of phosphorus. (Uma Reddy, 1999). Conventionally grown amaranthus, spinach and tomato registered significantly higher nitrogen and potassium content compared to organically grown vegetables (Table 2). Similar observation was reported by Hannaway *et al.*, (1980) in conventionally grown crops.

Conventional potassium fertilizers dissolve readily in soil water in large quantities while organically managed soils hold moderate quantities in the root zone of the plant and higher potassium fertilizer can reduce the absorption of magnesium and phosphorus content. The lower absorption of nitrogen content by the crops from the organic manure i.e., FYM and CD might be attributed to the non availability of adequate nutrients throughout the crop growth period, as nitrogen release was slow from applied manures in onion and tomato with FYM (Uma Reddy, 1999).

Nitrate pollution

Conventionally grown amaranthus, spinach and tomato were found to contain significantly higher nitrates compared to organically grown crops. Among the organic manures, vermicompost application to amaranthus and spinach in kharif and poultry manure application to amaranthus and spinach in rabi and tomato(both the seasons) resulted in significantly higher nitrates. Increase in nitrate levels were reported in conventionally grown crops potatoes, lettuce, leeks, spinach by FineSilver *et al.* (1989) and Woese *et al.* (1997). The nitrates are commonly developed by the application of nitrogen through chemical fertilizers and as well as by organic manures. Nitrate level in plants is determined by a number of factors, such as variety, light intensity, climate and soil and specifically nitrogen supply. Nitrogen application depends on the amount of the fertilizer applied, availability of nitrogen during the period of growth and time of application to the plant. These have been considered as the source of nitrate variability in many studies compared to organically versus conventionally grown produce. In many organic fertilizers, the organically bound nitrogen is relatively insoluble and not available easily to the plant. In contrast, the nitrogen in mineral fertilizers is soluble and is readily available to the plant (Finesilver *et al.*, 1989). Even organic fertilizers, may however, increase nitrate levels in vegetables, depending on the type and amount of organic fertilizer applied (Termine *et al.*, 1987). In general, extensive use of chemical fertilizers and organic manures with high nitrogen increase nitrate content in vegetables regardless of the kind of fertilizers or organic manures. There is also a higher risk of contamination of ground water with nitrates when over fertilization takes place. (Sohn and Yoneyama, 1996).

Table 2: NPK Content of organically and conventionally grown vegetables

Treatment	Amaranthus		Spinach		Tomato	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Phosphorus						
Vermicompost	70.17	70.72	21.05	21.65	32.25	33.80
Farm yard manure	85.96	86.49	25.20	25.78	36.56	38.13
Poultry manure	93.83	94.38	28.34	28.93	37.25	38.55
Cow dung	55.09	55.64	23.35	23.95	33.30	34.85
Control	42.84	43.37	22.70	23.25	22.45	24.00
SEM	0.09	0.10	0.26	0.26	0.27	0.29
CD(0.01)	0.29*	0.31*	0.79*	0.79*	0.84*	0.89*
C.V%	0.30	0.30	2.10	2.10	1.70	1.70
Potassium						
Vermicompost	342.25	343.78	245.60	249.38	203.23	208.28
Farm yard manure	353.45	355.00	257.13	246.98	225.10	226.68
Poultry manure	373.18	374.80	280.53	282.08	255.25	257.05
Cow dung	350.05	351.60	247.83	258.70	206.73	204.78
Control	389.60	391.15	292.45	299.00	261.45	263.00
SEM	1.16	1.17	7.45	7.10	1.03	1.00
CD(0.01)	3.58*	3.61*	22.94*	21.89*	3.17*	3.09*
C.V%	0.60	0.60	5.60	5.30	1.00	0.90
Nitrogen						
Vermicompost	0.55	0.79	0.56	0.65	0.28	0.32
Farm yard manure	0.53	0.77	0.51	0.59	0.24	0.31
Poultry manure	0.57	0.79	0.60	0.70	0.26	0.32
Cow dung	0.41	0.63	0.53	0.64	0.23	0.25
Control	0.57	0.83	0.62	0.72	0.30	0.33
SEM	0.018	0.023	0.019	0.013	0.001	0.002
CD(0.01)	0.055*	0.072*	0.057*	0.039*	0.003*	0.005*
C.V%	6.8	6.1	6.6	3.9	0.7	1.1

* Significant at P=0.01 level ; NS – Not significant

Table 3: Nitrate content (mg kg^{-1}) of organically and conventionally grown vegetables

Treatment	Amaranthus		Spinach		Tomato	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Vermicompost	2302.53	2178.16	2326.66	3111.06	2184.33	2359.44
Farm Yard Manure	2008.80	2389.87	1823.56	2242.91	2302.07	2426.95
Poultry Manure	2225.55	2680.39	2249.26	3282.47	2420.28	2483.30
Cowdung	2258.40	2442.05	2057.32	2301.07	2277.38	2209.91
Control	2467.30	3327.73	3209.86	4622.67	2649.48	3108.93
SEM	21.27	90.61	57.12	142.57	45.20	27.45
CD(0.01)	83.48*	355.67*	224.21*	559.63*	177.43*	107.76*
C.V%	1.30	4.90	3.50	6.50	2.70	105.00

* Significant at P<0.01 level

Microbiological safety

Total bacterial count in freshly harvested amaranthus crop was significantly higher in poultry manure applied crop in kharif and cow dung applied crop in rabi. Significantly higher total bacterial count was observed in freshly harvested spinach crop cultivated in plots with poultry manure in both the seasons followed by VC>CD>FYM>Control. Cow dung application to tomato crop resulted in significantly higher total bacterial count followed by PM>VC>FYM>Control in kharif crops and poultry manure application to rabi crop registered significantly higher total bacterial count followed by VC>CD>FYM>Control. (Table 4).

Table 4: Total bacterial count of freshly harvested organically and conventionally grown crops

Treatment	Kharif	Rabi
Amaranthus		
Vermicompost	$3x10^4$	$3.5x10^4$
Farm yard manure	$3.25x10^4$	$3.5x10^4$
Poultry manure	$5.25x10^4$	$4.5x10^4$
Cow dung	$3.5x10^4$	$4.75x10^4$
Control	$6.5x10^3$	$7x10^2$
F value	*	*
CV%	29.1	17.5
Spinach		
Vermicompost	$5.5x10^4$	$5x10^4$
Farm yard manure	$3.5x10^4$	$3.5x10^4$
Poultry manure	$6.5x10^4$	$6.5x10^4$
Cow dung	$4.75x10^4$	$5.75x10^4$
Control	$3.3x10^3$	$4.5x10^4$
F value	*	*
CV%	15.3	17.1
Tomato		
Vermicompost	$5.25x10^4$	$6x10^4$
Farm yard manure	$3x10^4$	$3.5x10^4$
Poultry manure	$5.5x10^4$	$7.5x10^4$
Cow dung	$6x10^4$	$4.75x10^4$
Control	$2.5x10^3$	$4.5x10^4$
F value	*	*
CV%	9.8	8.1

* Significant at P=0.01 level

As food borne pathogens such as Salmonella and Eseherichia coli may reside in the gastrointestinal tracts of animals and thus make their way into the manure, it has been suggested that organic crops may contain higher levels of pathogenic bacteria than conventional crops. Organic manures can be safeguarded against the potential microbiological danger by manuring at 55-77° C or allowing the manure to age at least 90 days before harvest (Mukherjee *et al.*, 2004). Based on the complete absence or extremely low prevalence of microbiological pathogens in organic produce, the assertion that organic produce has greater microbiological contamination does not seem to supported. In conventional agriculture, incidence of pests and plant disease is generally curtailed through the use of pesticides and fungicides. While these synthetic inputs are generally effective, pathogens may gain resistance after repeated applications, thus jeopardizing future production and forcing farmers to depend on increasingly intensive control programs or seek alternative forms of bio-control. Organic certification standards prohibit the use of such pesticides and fungicides, leading growers to seek alternate forms of disease control. High populations of beneficial microbes in compost and vermicompost allows for biological control of pathogenic fungi. Bio-control, or "general suppression" is carried out by the and interactions of soil microorganisms that compete with pathogens for resources or produce antibiotic chemicals. Generally, pathogen spores in compost-amended soils are more densely covered with beneficial fungal and bacterial population, thereby limiting their infectivity. These beneficial populations often parasitize the hyphae of pathogenic fungi. Additionally, by consuming the amino acids, carbohydrates, and volatile ethanols and aldehydes exuded from root and seed tissue and decomposing plant residue, beneficial microbes may reduce resources required by pathogenic fungal spores for germination. While antibiosis and resource competition by beneficial microbial populations my lead to decrease in pathogenic fungal spores, increased numbers of plant growth promoting rhizobacteria (PGPR) may also lead to increased induced systemic resistance (ISR) in the plant. ISR is a means of disease suppression is based on strengthening physiological defences against pathogenic fungi, bacteria and viruses (McClintock, 2004).

Soil mineral quality

Conventional fertilizer application to spinach crop resulted in significantly higher available iron in the soils compared to organic manures tested in both the seasons. Among the organic manures applied, vermicompost application to tomato crop resulted in significantly higher available iron. Vermicompost application to kharif and poultry manure application in rabi to the soils of amaranthus crop resulted in significantly higher available soil zinc compared to other organic manures and conventional fertilizers. Significantly higher available zinc in soil was observed in spinach kharif crop applied with vermicompost, and rabi crop applied with farm yard manure compared to other treatments. Similarly vermicompost application to tomato crop registered significantly higher available soil zinc. Poultry manure application to amaranthus, spinach and tomato crop registered significantly higher available soil calcium compared to the application of other organic

Table 5: Available mineral content (mg kg^{-1}) in soils of organically and conventionally grown vegetables

Treatment	Amaranthus		Spinach		Tomato	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Available Iron						
Vermicompost	5.07	4.75	3.60	4.05	5.52	5.28
Farm yard manure	4.53	4.73	3.55	3.50	3.99	3.52
Poultry manure	4.55	4.43	3.87	3.92	3.21	3.49
Cow dung	4.26	4.50	2.65	4.77	5.17	5.33
Control	4.18	4.26	4.56	4.79	3.06	4.10
SEM	0.36	0.32	0.25	0.04	0.32	0.66
CD(0.01)	NS	NS	1.01*	0.16*	1.26*	NS
C.V%	11.4	10.1	10.0	1.4	10.9	21.7
Available Zinc						
Vermicompost	1.12	0.90	0.78	0.77	1.58	2.03
Farm yard manure	0.38	0.91	0.75	0.83	0.53	1.78
Poultry manure	0.15	1.61	0.64	0.45	1.14	1.18
Cow dung	0.81	0.42	0.50	0.50	0.77	1.12
Control	0.92	0.48	0.57	0.69	0.79	0.98
SEM	0.04	0.07	0.03	0.06	0.03	0.17
CD(0.01)	0.11*	0.29*	0.09*	0.23*	0.09*	0.67*
C.V%	10.6	12.1	9.0	13.3	6.6	17.1
Available Calcium						
Vermicompost	8.20	8.56	7.37	7.70	7.66	7.85
Farm yard manure	6.91	6.60	6.63	7.05	5.52	5.75
Poultry manure	8.54	8.75	8.04	8.50	8.59	8.95
Cow dung	7.82	7.95	7.11	7.15	8.38	8.65
Control	6.81	6.75	5.42	5.45	7.78	7.65
SEM	0.17	0.16	0.09	0.10	0.06	0.05
CD(0.01)	0.52*	0.65*	0.28*	0.40*	0.19*	0.218
C.V%	4.4	3.1	2.6	2.0	1.6	1.0
Available Magnesium						
Vermicompost	7.82	7.70	6.52	7.10	7.19	7.50
Farm yard manure	6.26	6.70	6.41	6.65	9.82	10.20
Poultry manure	5.98	6.10	6.03	6.15	6.81	6.50
Cow dung	8.43	8.75	5.01	5.05	7.38	7.60
Control	7.24	7.30	4.30	4.60	3.86	4.50
SEM	0.11	0.18	0.17	0.15	0.14	0.24
CD(0.01)	0.34*	0.70*	0.1*	0.61*	0.44*	0.94*
C.V%	3.2	3.5	5.9	3.7	4.1	4.7

* Significant at P=0.01 level NS – Not significant

and conventional fertilizers in both the seasons. Cow dung application to amaranthus, vermicompost application to spinach and farmyard manure application to tomato crop registered significantly higher available soil magnesium in both the seasons, compared to other treatments. Many soils contain adequate available minerals, but in an unavailable form. Soil that has been managed organically has more microorganisms. These microorganisms produce many compounds that help plants such as citrate and lactate that combine with soil minerals and increase their availability to plant roots (Worthington, 2001). Therefore organic crops explain the trend of high availability and absorption of nutrients from organically managed soils. In spinach crop, significantly higher available soil nitrogen was found in vermicompost applied crop followed by control in kharif where as in rabi season, poultry manure application showed significantly higher available soil nitrogen followed by farm yard manure. Organic manure application to all vegetable crop soils registered significantly higher available soil phosphorus compared to conventional fertilizers and also were higher, compared to initial soils. Chemical fertilizer application to tomato crop recorded significantly higher available soil phosphorus compared to all organic manures tested in both the seasons.

Poultry manure application to amaranthus crop grown in rabi, registered significantly higher available soil potassium compared to control and initial soil values. In spinach crop, vermicompost application registered significantly higher available soil potassium compared to control and initial soil values in both the seasons.

Table 6. Available NPK content (kg ha^{-1}) in soils of organically and conventionally grown vegetables

Treatment	Amaranthus		Spinach		Tomato	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Nitrogen						
Vermicompost	267.62	301.06	319.70	307.33	172.35	388.68
Farm yard manure	251.09	307.32	254.73	344.96	184.93	357.50
Poultry manure	256.56	294.79	269.84	363.77	195.74	370.05
Cow dung	248.11	282.24	251.28	334.37	187.40	388.86
Control	270.05	370.05	305.92	351.23	247.82	365.875
SEM	9.583	30.21	7.80	3.43	2.87	7.96
CD(0.01)	NS	NS	24.01	13.49	8.82	NS
C.V%	7.4	13.7	5.6	1.4	2.9	3.0
Phosphorus						
Vermicompost	49.61	46.52	49.54	37.85	22.98	25.94
Farm yard manure	25.25	27.37	26.43	22.85	30.24	31.75
Poultry manure	77.76	72.62	33.94	72.77	29.99	31.77
Cow dung	75.41	77.45	75.16	78.10	35.47	35.47
Control	65.96	62.80	52.96	59.52	40.01	40.01
SEM	1.10	1.67	1.72	0.47	1.48	1.16
CD(0.01)	4.32*	6.46*	6.76*	1.85*	5.83*	4.55*
C.V%	2.6	4.1	5.1	1.2	6.6	5.0
Potassium						
Vermicompost	239.77	260.26	288.69	290.36	292.20	206.60
Farm yard manure	229.03	253.70	209.54	217.76	238.84	252.98
Poultry manure	243.14	278.84	256.58	268.35	244.21	254.78
Cow dung	240.85	273.91	249.86	261.55	248.24	231.91
Control	233.42	227.92	253.89	265.43	253.22	272.21
SEM	17.76	5.70	10.31	9.72	22.54	16.15
CD(0.01)	NS	22.40	40.48	38.17	NS	NS
C.V%	10.6	3.1	5.8	5.3	12.5	9.4

* Significant at P=0.01 level ; NS – Not significant

Soil microbiological quality

Total plate count of bacteria in all crops applied with organic manures were significantly higher compared to conventional crops. Total bacterial count of the soils applied with poultry manure in kharif and cow dung in rabi crop of amaranthus was significantly higher compared to soils fertilized with conventional fertilizers. Poultry manure application to spinach crop registered significantly higher total bacterial count followed by VC>CD>FYM>Control in both the crop seasons. In tomato crop, poultry manure application resulted in significantly higher total bacterial count followed by VC>FYM>CD>Control in kharif crop and VC>CD>FYM>Control in rabi crop(Table 7).

Table 7. Total bacterial count of soils of organically and conventionally grown vegetables

Treatment	Kharif	Rabi
Amaranthus		
Vermicompost	$3x10^7$	$2.5 x10^7$
Farm Yard Manure	$2.5 x10^7$	$3.5 x10^7$
Poultry Manure	$6.5 x10^7$	$7.5 x10^7$
Cow Dung	$9 x10^7$	$9.5 x10^7$
Control	$4.2 x10^6$	$5 x10^6$
CD(0.01)	*	*
C.V%	14.5	13.2
Spinach		
Vermicompost	$10x10^7$	$6.5 x10^7$
Farm Yard Manure	$3 x10^7$	$4.5 x10^7$
Poultry Manure	$14 x10^7$	$12 x10^7$
Cow Dung	$3.6x10^7$	$5.5 x10^7$
Control	$8 x10^5$	$7 x10^6$
CD(0.01)	*	*
C.V%	35.2	4.4
Tomato		
Vermicompost	$14x10^7$	$15.5 x10^7$
Farm Yard Manure	$8 x10^7$	$8 x10^7$
Poultry Manure	$18x10^7$	$19x10^7$
Cow Dung	$3.5x10^7$	$11 x10^7$
Control	$8 x10^6$	$8.5 x10^6$
CD(0.01)	*	*
C.V%	26.7	20.3

* Significant at P<0.01 level

Conclusion

Organic agriculture got a big boost from this study proving that vegetables grown without chemical fertilizers contains significantly larger quantities of essential mineral compounds associated with improved health. Organic farming is a reliable way to increase nutrients *i.e* micronutrients, decrease nitrate levels through foods. Although many people in the third world do not have enough food even once a day, those in the developed countries are concerned about the quality of food. Organic farming may lead to a good national food security option of healthy food for growing population, instead of creating an export oriented business alone. Organic food could be the right answer to India's quest for healthy and rejuvenated living. There is a need to carry out a nationwide campaign to educate consumers about the benefits of consuming organic foods and enlighten farmers to switch over to organic farming to boost production of quality produce.

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