ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 5(E), pp. 26781-26786, May, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

AN ASSESSMENT OF PESTICIDE RESIDUES AND OTHER PARAMETERS IN MUSTARD UNDER EXPERIMENTAL CONDITIONS

Alka Kataria[1]* and Khan T. I[2]

[1]Department of Environmental Science, The IIS University, Jaipur
[2]Indira Gandhi Center for Human Ecology, Environmental and Population Studies, University of Rajasthan, Jaipur

DOI: http://dx.doi.org/10.24327/ijrsr.2018.0905.2121

ARTICLE INFO

Article History:

Received 15th February, 2018
Received in revised form 25th March, 2018
Accepted 28th April, 2018
Published online 28th May, 2018

Key Words:

Organic and Inorganic Fertilizers, Pesticide Residue, Mustard, Treatment Levels

ABSTRACT

An experiment of Mustard was conducted during Rabi, 2017 on loamy sand soil (Jaipur, Rajasthan). The experiments were aimed to see the impact of organic, inorganic fertilizers and pesticides on the plant growth and other parameters. Observations were made on growth parameters and some physiological and biochemical parameters such as plant protein content, plant nitrogen content, plant carbohydrate content, chlorophyll content (chlorophyll a, chlorophyll b and total chlorophyll) and pesticide residue using standard techniques. The experiment consisted of five treatment levels (T1, T2, T3, T4 and T5) and they were tested in randomized block design with four replications. In total twenty plots were maintained. Results revealed that in treatment level, T5, plant growth response remained the best. In this treatment level only vermicompost was applied and no other material was added.

INTRODUCTION

The increasing human population has been increasing the demand for more food production, which can be fulfilled by increasing production. Crops when grown multiple or repeated times in a single field may cause depletion of nutrient status of soil (Haileslassie, 2005). Although soils contain natural reserves, but these reserves are largely present in unavailable forms to plants or released in a minor quantity which cannot compensate the removal of nutrients by agriculture production. So when seeds are sown in the field, it becomes essential to add fertilizers either organic or inorganic, for their further growth, as fertilizers are designed to supplement the nutrients already present in the soil. Organic fertilizers include compost, manure etc. and inorganic fertilizers include synthetic fertilizers. If these synthetic fertilizers added in huge amount in agricultural fields, results in negative effects such as leaching-Nitrogen (Mulvaney *et al.,* 2009; Melo *et al.,* 2012; Mogle *et al.,* 2013), pollution of water resources like algal bloom etc. (Maheshwari *et al.,* 2013; Huang *et al.*, 2014), loss of soil microorganisms and friendly insects, acidification or alkalization of the soil (Hermary, 2007). In turn organic fertilizers are beneficial and do not harm the environment (Stolze *et al*, 2000; Abbott and Manning, 2015).

A variety of pests can be seen in the crop fields due to change in climate. According to the farmers, one pesticide is not sufficient to kill a single pest, so they have add a number of pesticides for killing the pests, which in turn increases types and amount of pesticide residues in the field.

In view of the above points, the present study intends to investigate the effect of chemical fertilizers and organic fertilizers and chemical pesticides and organic pesticides used in different ratios on various physiological and biochemical parameters of Mustard plant.

MATERIAL AND METHODS

Field experiments were conducted in a farm located at Narayanpuri, Sirsi road, Jaipur, Rajasthan during the Rabi season of 2017 using *Brassica juncea* (L.) var. Pusa Bold (Mustard) as test crop. *Brassica juncea* (Mustard) is an herbaceous annual and belongs to family "Brassicaceae". The seeds of the test species were sown in a completely randomized block design with five treatment levels including control. Each treatment had four replications (Fig. 1 and 2). The observations were done at three observation stages viz. pre flowering stage, peak flowering stage and post flowering stage for growth

Corresponding author:* **Alka Kataria
Department of Environmental Science, The IIS University, Jaipur

analysis (like shoot length, root length, root dry weight and shoot dry weight) and for other biochemical analysis.

Details of the experimental design are as follows:

T1= CONTROL
T2= CONMIN (Conventionally Mineralized)-Mineral Fertilizers and Chemical Pesticides.
T3= CONFYM (Conventionally Organic) - Organic Manure (half the amount applied in T4), Mineral Fertilizers and Chemical Pesticides, Biofertilizer (half the amount applied in T4).
T4= BIOMIN (Biologically Mineralized) - Organic Manure, Mineral Fertilizers (half the amount applied in T3), Biopesticide, Biofertilizer, Chemical Pesticides.
T5= BIODYNAMIC (Biodynamic) - Organic Manure, Biofertilizer, Biopesticide.

Fig 1 Photograph showing the plots (Experimental) for the Mustard crop.

Fig 2 Checking of the pests in Mustard plot (experimental area) by one of the farmers of the study area.

The following parameters were studied during the study:

Growth Parameters

Measurement of Root and Shoot Length

Five crop plants from each treatment level were taken from different replicated plots, so in total twenty five crop plants were taken from five treatment levels at each observation stage, for root and shoot length determination. For the measurement of Root and Shoot lengths meter scale was used. Growth above the soil surface to the apical tip was taken as shoot length and the total length of the main axis of root was taken as root length.

Determination of Dry Weight (Root and Shoot System)

For dry weight determination, individual plants were carefully taken from plots keeping the root and shoot system intact and were washed thoroughly in running water to remove soil particles. After separating the root and shoot of each plant, they were oven dried at 80^{o}C for 72 hours and then weighed.

Biochemical analysis

Chlorophyll a, b and total chlorophyll content in fresh leaves of treated and control plants were determined by Arnon's method (1949). Carbohydrate content was estimated by Standard Anthrone method, Plant Nitrogen and Protein content was estimated by colorimetric method (Snell and Snell, 1949). Extraction of Pesticides from green fodder was done by QuEChERS method [AOAC (2012) Official method 2207.01] and extraction of Pesticides from oilseeds was done by Mills, P.A. *et. al.,* (1972). The samples after extraction and cleanup were estimated using Shimadzu 2010 Gas Chromatograph equipped with a Ni^{63} Electron Capture Detector (ECD) for determining pesticides residue in root system and oilseeds. For differences between several mean values of the control and exposed seedlings, analysis of variance (ANOVA) was performed by using INDOSTAT software.

RESULTS AND DISCUSSION

The organically treated (T5) plants of *Brassica juncea* showed a maximum increase in root dry weight (76.02%) and shoot dry weight (84.01%), total dry weight (83.76%), root length (54.81%), shoot length (50.36%), total length (50.86%) (Fig. 3(a-c) and total chlorophyll content (21.63%) at post-flowering stage (Table 1(b-d). While a maximum increase in carbohydrate (19.44%), nitrogen (22.30%) and protein (22.15%) content was found at peak-flowering stage in organically treated (T5) plants (Table 1a).

Fig 3a Photograph showing the effect of organic and chemical fertilizers and pesticides on growth of *Brassica juncea* (L.) var. Pusa Bold at different treatment levels in Pre-Flowering Stage

Fig 3b Photograph showing the effect of organic and chemical fertilizers and pesticides on growth of *Brassica juncea* (L.) var. Pusa Bold at different treatment levels in Peak-Flowering Stage.

Fig 3c Photograph showing the effect of organic and chemical fertilizers and pesticides on growth of *Brassica juncea* (L.) var. Pusa Bold at different treatment levels in Post-Flowering Stage

The results of pesticide residue analyzed in root system and in seeds of *Brassica juncea* at pre-flowering, peak-flowering and post-flowering stages are given in Table 2. Methyl Paraxon residues were detected only in treatments receiving methyl paraxon application. None of the residues were detected in CONTROL, pure organic combination-BIODYNAMIC and recombinant combination-BIOMIN. In CONMIN (T2) treatment of pre flowering, peak flowering and post flowering, the concentration of methyl paraxon detected in root system was ND (pre flowering), 0.646 ppm (peak flowering), 0.235 ppm (post flowering) respectively and in seeds the concentration of methyl paraxon detected was 0.073 ppm.

In case of CONFYM (T3) treatment, the concentration of methyl paraxon detected in root system was ND (pre flowering), 0.281 ppm (peak flowering) and 0.153 ppm (post flowering) respectively and in seeds the concentration of methyl paraxon detected was 0.015 ppm. The concentration of pesticide residue was higher in peak flowering stage.

The analysis of variance (ANOVA) revealed that sum of squares due to treatments, observation stages and interactions were highly significant for all the plant parameters. It revealed that spraying or spreading of pesticide in CONMIN crop plants affected all plant parameters and the interaction between treatments and observation stages was highly significant (Table 3).

Earlier studies by Vasilikiotis (2000) and Poudel *et al.* (2002) reported that massive use of chemical fertilizers and toxic pesticides in the crop field has led to some severe environmental consequences, including loss of topsoil, decrease in soil fertility, surface and ground water contamination (N leaching), and loss of genetic diversity.

Table 1a Effects of Organic and Chemical Fertilizers and Pesticides on Carbohydrate content, Nitrogen content and Protein content of *B. juncea* (L.) var. Pusa Bold.

Treatments	Carbohydrate (mg/gm) (Leaves)			Nitrogen % (Leaves)			Protein % (Leaves)		
	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering
T1	41.32±0.345	55.19±0.249	46.09±0.166	0.436±0.020	0.520±0.019	0.507±0.011	2.72±0.128	3.25±0.120	3.16±0.072
T2	45.82±0.638 (10.89)	62.15±0.492 (12.61)	50.58±0.534 (9.74)	0.483±0.016 (10.77)	0.587±0.043 (12.88)	0.563±0.010 (11.04)	3.01±0.097 (10.66)	3.66±0.268 (12.61)	3.51±0.067 (11.07)
T3	46.63±0.566 (12.85)	62.77 ±0.442 (13.73)	52.25±0.732 (13.36)	0.491±0.024 (12.61)	0.608±0.010 (16.92)	0.574±0.016 (13.21)	3.06±0.152 (12.5)	3.80±0.067 (16.92)	3.58±0.101 (13.29)
T4	47.84±0.356 (15.77)	63.73±0.363 (15.47)	52.72±0.367 (14.38)	0.512 ±0.009 (17.43)	0.615±0.005 (18.26)	0.588±0.016 (15.97)	3.2±0.101 (17.64)	3.84±0.029 (18.15)	3.67±0.099 (16.13)
T5	49.12±0.641 (18.87)	65.92±0.253 (19.44)	54.16±0.851 (17.50)	0.525±0.008 (20.41)	0.636±0.009 (22.30)	0.603±0.010 (18.93)	3.28±0.055 (20.58)	3.97±0.058 (22.15)	3.76±0.066 (18.98)

Values of mean of replicates±S.D, Data in parenthesis denotes percentage increase.

Table 1b Effects of Organic and Chemical Fertilizers and Pesticides on Chl *a*, Chl *b* and Total Chl of *B. juncea* (L.) var. Pusa Bold.

Treatments	Chlorophyll-a (mg gm^{-1})			Chlorophyll-b (mg gm^{-1})			Total Chlorophyll (mg gm-^{1})		
	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering
CONTROL (T1)	0.322±0.025	0.831±0.007	0.712±0.022	0.149±0.013	0.398±0.020	0.314±0.016	0.471±0.026	1.229±0.026	1.026±0.031
CONMIN (T2)	0.363±0.038 (12.73)	0.935±0.006 (12.51)	0.835±0.014 (17.27)	0.165±0.014 (10.73)	0.443±0.030 (11.30)	0.352±0.020 (12.10)	0.528±0.027 (12.10)	1.378±0.024 (12.12)	1.187±0.034 (15.69)
CONFYM (T3)	0.368±0.006 (14.28)	0.953±0.016 (14.68)	0.844±0.018 (18.53)	0.169±0.009 (13.42)	0.452±0.008 (13.56)	0.364±0.023 (15.92)	0.537±0.011 (14.01)	1.405±0.008 (14.32)	1.208±0.036 (17.73)
BIOMIN (T4)	0.379±0.014 (17.70)	0.989±0.185 (19.01)	0.861±0.020 (20.92)	0.172±0.012 (15.43)	0.465±0.032 (16.83)	0.372±0.017 (18.47)	0.551±0.023 (16.98)	1.454±0.197 (18.30)	1.233±0.033 (20.17)
BIODYNAMIC (T5)	0.390±0.024 (21.11)	1.002±0.030 (20.57)	0.869±0.017 (22.05)	0.178±0.014 (19.46)	0.473±0.021 (18.84)	0.379±0.026 (20.70)	0.568±0.029 (20.59)	1.485±0.012 (20.82)	1.248±0.015 (21.63)

Values of mean of replicates±S.D, Data in parenthesis denotes percentage increase.

Table 1c Effects of Organic and Chemical Fertilizers and Pesticides on root dry weight, shoot dry weight and total dry weight of *B. juncea* (L.) var. Pusa Bold.

Treatments	Root dry weight (gm)			Shoot dry weight (gm)			Total dry weight (gm)		
	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering
CONTROL (T1)	0.193±0.008	0.627±0.010	1.46±0.037	3.37±0.210	15.32±0.148	45.98±0.292	3.563±0.219	15.947±0.157	47.44±0.263
CONMIN	0.21±0.032	0.73±0.033	1.68±0.043	4.89±0.187	17.44±0.160	60.57±0.230	5.102±0.207	18.175±0.189	62.25±0.566
(T2)	(9.84)	(17.22)	(15.06)	(45.10)	(13.83)	(31.73)	(43.19)	(13.97)	(31.21)
CONFYM	0.28±0.026	0.90±0.180	1.93±0.238	5.46±0.355	20.89±0.162	66.56±0.397	5.746±0.333	21.791±0.330	68.49 ±0.493
(T3)	(48.18)	(43.70)	(32.19)	(62.01)	(36.35)	(44.75)	(61.26)	(36.64)	(44.37)
BIOMIN	0.31±0.053	1.01±0.030	2.34±0.282	5.94±0.208	23.21±0.202	76.40±0.394	6.25±0.210	24.225±0.179	78.74 ±0.189
(T4)	(60.62)	(61.88)	(60.27)	(76.26)	(51.50)	(66.15)	(75.41)	(51.90)	(65.97)
BIODYNAMIC	0.33±0.011	1.07±0.147	2.57±0.170	6.13±0.175	26.73±0.400	84.61±0.253	6.464±0.174	27.804±0.336	87.18 ±0.348
(T5)	(73.05)	(71.29)	(76.02)	(81.89)	(74.47)	(84.01)	(81.42)	(74.35)	(83.76)

Values of mean of replicates±S.D. (Data in parenthesis denotes percentage increase).

Table 1d Effect of Organic and Chemical Fertilizers and Pesticides on Root Length, Shoot Length and Total Length of *B. juncea* (L.) var. Pusa Bold at different treatment levels

Treatments	Root Length (cm)			Shoot Length (cm)			Total Length (cm)		
	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering	Pre-Flowering	Peak-Flowering	Post-Flowering
CONTROL(T1)	5.5±0.330	10.8±0.250	16.6±0.403	11.7±0.386	75.4±1.216	139.1±1.294	17.2±0.588	86.2±1.206	155.7±1.531
CONMIN	6.1±0.273	13.3±0.129	19.7±0.332	12.8±0.362	89.2±1.454	156.7±1.355	18.9±0.572	102.5±1.526	176.4±1.419
(T2)	(10.90)	(23.14)	(18.67)	(9.40)	(18.30)	(12.65)	(9.88)	(18.90)	(13.29)
CONFYM	6.8±0.276	14.4±0.374	22.3±0.358	14.6±0.242	92.4±1.223	173.5±1.374	21.4±0.408	106.8±1.496	195.8±1.734
(T3)	(23.63)	(33.33)	(34.33)	(24.78)	(22.54)	(24.73)	(24.41)	(23.89)	(25.75)
BIOMIN	7.9±0.314	15.2±0.271	23.5±0.250	15.9±0.355	103.6±1.341	198.3±1.432	23.8±0.189	118.8±1.374	221.8±1.660
(T4)	(43.63)	(40.74)	(41.56)	(35.89)	(37.40)	(42.55)	(38.37)	(37.81)	(42.45)
BIODYNAMIC	8.4 ±0.285	16.4±0.216	25.7±0.356	17.5±0.267	110.4±1.216	209.2±1.253	25.9±0.588	126.8±1.424	234.9±1.374
(T5)	(52.72)	(51.85)	(54.81)	(49.57)	(46.41)	(50.39)	(50.58)	(47.09)	(50.86)

Values of mean of replicates±S.D. (Data in parenthesis denotes percentage increase)

Table 2 Methyl Paraxon Residues (ppm) in *B. juncea* (L.) var. Pusa Bold, at Pre, Peak and Post-Flowering Stages in Field Experiment.

	Plant Parts	Treatments				
		T1 (CONTROL) (ppm)	T2 (CONMIN) (ppm)	T3 (CONFYM) (ppm)	T4 (BIOMIN) (ppm)	T5 (BIODYNAMIC) (ppm)
Pre flowering	Root	ND	ND	ND	ND	ND
Peak flowering	Root	ND	0.646±0.034	0.281±0.059	ND	ND
Post flowering	Root	ND	0.235±0.056	0.153±0.021	ND	ND
	Fruit	ND	0.073±0.089	0.015±0.048	ND	ND

Values of mean of replicates±S.D.; ND-Not Detectable

Table 3 Analysis of Variance due to different treatments on different parameters of *Brassica juncea* (L.) var. Pusa Bold (Experimental Conditions)

Source of Variance	D.F.	Mean Sum of Squares											
		Shoot Length	Root Length	Total Length	Root Dry Weight	Shoot Dry Weight	Total Dry Weight	Chlorophyll a	Chlorophyll b	Total Chlorophyll	Carbohydrate	Nitrogen	Protein
Interactions (Observation Stages x Treatments)	8	720.5497** (6194.259)	5.783** (57.973)	848.288** (3290.673)	0.167** (10.225)	207.813** (2952.49)	219.378** (2350.47)	0.00231** (0.8158)	0.00039** (0.9236)	0.00446** (1.326)	1.829** (9.318)	0.00014** (0.4373)	0.0054** (0.4373)
Observation Stages	2	129375.2** (1112183.8)	1071.24** (10738.88)	153989.8** (597355.8)	15.373** (936.61)	20561.9** (292132.1)	21696.02** (232457.038)	1.863** (656.627)	0.4069** (954.71)	3.999** (1187.002)	1312.155** (6683.168)	0.059** (184.799)	2.304** (184.799)
Treatments	4	2650.773** (22787.570)	61.946** (620.992)	3513.61** (13629.99)	0.661** (40.306)	553.255** (7860.34)	591.676** (6339.380)	0.0328** (11.587)	0.0057** (13.549)	0.0658** (19.534)	133.620** (680.566)	0.0174** (54.551)	0.680** (54.551)
Error	42	0.1163	0.0997	0.2577	0.0164	0.0703	0.09333	0.00283	0.000426	0.00336	0.1963	0.000319	0.01247

P value
Data in Parenthesis denotes F value
<0.001 (extremely significant) denoted by ***
0.001 to 0.01 (very significant) denoted by **
0.01 to 0.05 (significant) denoted by *
>0.05 (not significant) denoted by ^{ns}

Contrary to this, Rosen and Allan (2007); Sharma *et al.* (2014); Sharma (2012); Eyheragui *et al.* (2008); Herencia *et al.* (2008) and Suge *et al.* (2011) reported that the application of organic nutrient sources (biofertilizers, plant compost or manure) improves the soil quality (increase in the organic carbon content, N, available P, K and moisture content of the soil and larger pools of stored nutrients), crop yield (increase the plant height, dry matter accumulation per metre row length) nitrogen and phosphorus concentration and taste of the fruit than conventional farming.

Extensive use of pesticides in agricultural fields leaves pesticide residues in vegetables and crop plants (Parihar (2015); Leu (2014), Bhanti and Taneja (2007) and Swarnam and Velmurugan (2013). This pesticide accumulation in vegetables or crops may pose serious threat to human health (Eyhorn *et al.* (2015); Kamel and Hoppin (2004); Baldi *et al.* (2003); Galloway and Handy (2003); Gebremichael *et al.* (2013) and Qu *et al.* (2010).

Various studies have also found that use of thiram for seed treatment and subsequent treatment with any pesticide significantly reduces plant growth, its dry weight, chlorophyll content, percentage protein, percentage nitrogen, carbohydrate content (Tiyagi *et al.* 2004; Saladin *et al.* 2005; Chopade *et al.* 2007; Fox *et al.* 2007; El-Daly 2008; Karanatsidis and Berova 2009; Parween *et al.* 2011 and Sharma *et al.* 2012). Thus, the practice of using various pesticides to kill a single pest should be checked in order to reduce biomagnifications of pesticides via food chain.

CONCLUSION

It is concluded from the present study that organic farming (BIODYNAMIC-T5) using bio-fertilizers and organic manure has significant effect on crop quality as well as on its quantity and causes no environmental hazard. But in conventional farming, (CONMIN-T2) pesticides and chemical fertilizers reduces plant growth, its dry weight, chlorophyll content, percentage protein, percentage nitrogen, carbohydrate content and may affect environmental components by releasing residues in the environment.

Acknowledgement

The authors are thankful to Dean Faculty of Science, and Director, Indira Gandhi Center for Human Ecology, Environmental and Population Studies, University of Rajasthan, Jaipur and Rajasthan Agriculture Research Institute, Jaipur, for providing us facilities. One of the authors (AK) is thankful to UOR for financial assistance as Junior Research Fellow.

References

Abbott, L. K. and Manning, D. A. (2015): Soil Health and Related Ecosystem Services in Organic Agriculture. Sustainable Agriculture Research, 4 (3): 116-125.

AOAC (2012). *Official Mehtods of Analysis of Association of Official Analytical Chemists International*, *2007-01*. (G. W. Latimer (Jr.), 19th ed.) Maryland, USA: AOAC, International.

Arnon, D. I. (1949): Copper enzymes in isolated chloroplasts polyphenyloxidase in Beta vulgaris. Plant Physiology, 24: 1-15.

Baldi, I., Lebailly, P., Mohammed-Brahim, B., Letenneur, L., Jean-Francois, D. and Brochard, P. (2003): Neurodegenerative Diseases and Exposure to Pesticides in theelderly. *American Journal of Epidemiology,* 157: 409-414.

Bhanti, M. and Taneja, A. (2007): Contamination of vegetables of different seasons with Organophophorus Pesticides and related health risk assessment in Northern India. Chemosphere, 69 (1): 63-68.

Chopade, A. R., Naikwade, N. S., Nalawade, A. Y., Shinde, V. B. and Burade, K. B. (2007): Effects of Pesticides on Chlorophyll content in Leaves of Medicinal Plants. Pollution Research , 26 (3): 491-494.

El-Daly, F. A. (2008): Biochemical Influence of Cyanophos Insecticide on Radish Plant II. Effect on Some Metabolic Aspects during the growth period. *Research Journal of Agriculture and Biological Sciences,* 4 (3): 210-218.

Eyheragui, B., Silvestre, J. and Morard, P. (2008): Effects of humic substances derived from organic waste enhancement on the growth and mineral nutrition of Maize. *Bioresource Technology ,* 99 (10): 4206-4212.

Eyhorn, F., Roner, T. and Specking, H. (2015): Pesticide reduction in agriculture-What action is needed? Helvetas Swiss Intercooperation, 1-19.

Fox, J. E., Gulledge, J., Engelhaupt, E., Burrow, M. E. and McLachlan, J. A. (2007): Pesticides Reduce Symbiotic Efficiency of Nitrogen-Fixing Rhizobia and Host Plants. *Proceedings of the National Academy of Sciences. 104*, pp. 10282-10287. United States of America: National Academy of Sciences.

Galloway, T. and Handy, R. (2003): Immunotoxicity of Organophosphorous Pesticides. *Ecotoxicology*, 12: 345-363.

Gebremichael, S., Birhanu, T. and Tessema, D. A. (2013): Analysis of Organochlorine Pesticide Residues in Human and Cow's Milk in the towns of Aendabo, Serbo and Jimma in South-Western Ethiopia. *Chemosphere*, 90 (5): 1652-1657.

Haileslassie, A., Priess, J., Veldkamp, E., Teketay, D. and Lesschen, J. P. (2005): Assessment of soil nutrient depletion and its spatial variability on smallholders' mixed farming systems in Ethiopia using partial versus full nutrient balances. Agriculture, Ecosystems and Environment, 108: 1-16.

Herencia, J. F., Ruiz, J. C., Melero, S., Galavis, P. G. and Maqueda, C. (2008): A short term comparison of organic v. conventional agriculture in a silty loam soil using two organic amendments. *Journal of Agriculture Science*, 146: 677-687.

Hermary, H. (2007): Effects of Some Synthetic Fertilizers on the Soil Ecosystem. Heidi Hermary, 1-6.

Huang, W., Bi, Y. and Hu, Z. (2014): Effects of Fertilizer-Urea on Growth, Photosynthetic Activity and Microcystins Production of *Microcystis aeruginosa* isolated from Dianchi Lake. *Bulletin of Environmental Contamination and Toxicology*, 92(5): 514-519.

Kamel, F. and Hoppin, J. A. (2004): Association of Pesticide Exposure with Neurologic Dysfunction and Disease. Environ Health Perspect., 112 (9): 950-958.

Karanatsidis, G. and Berova, M. (2009): Effect of Organic-N Fertilizeron growth and some Physiological parameters in Pepper Plants (Capsicum Annum L.). *XI Anniversary Scientific Conference,120 years of Academic Education in Biology* (pp. 254-257). Bulgaria: Biotechnology and Biotechnology EQ. 23.

Leu, A. and Shiva, V. (2014): *The Myths of Safe Pesticides.* USA: Acres.

Maheshwari, R. K., Chauhan, A. K., Lal, B. and Sharma, A. K. (2013): Nitrate Toxicity in Groundwater: Its Clinical Manifestations, Preventive Measures and Mitigation Strategies. *Octa Journal of Environmental Research*, 1 (3): 217-230.

Melo, A., Pinto, E., Aguiar, A., Mansilha, C., Pinho, O. and Ferreira, I. M. (2012): Impact of Intensive Horticulture Practices on Groundwater content of Nitrates, Sodium, Potassium and Pesticides. *Environ. Monit. Assess.*, 184: 4539-4551.

Mills, P. A., Bong, B. A., Kamps, L. R. and Burke, J. A. (1972): Micromethod for Florisil Cleanup Using Methylene Chloride Containing Solvents as Eluants. *J. Ass. off. Analyt. Chem.*, 55: 39-43.

Mogle, U. P., Naikwade, P. V. and Patil, S. D. (2013): Residual Effect of Organic Manure on Growth and Yeild of *Vigna unguiculata* (I) Walp and *Lablab purpureus* L. Science Research Reporter, 3 (2): 135-141.

Mulvaney, R. L., Khan, S. A. and Ellsworth, T. R. (2009): Synthetic Nitrogen Fertilizers Deplete Soil Nitrogen: A Global Dilemma for Sustainable Cereal Production. *Journal of Environmental Quality*, 38: 2295-2314.

Parihar, S. (2015): Pesticides found in farmgate vegetable in western Rajasthan, India. *Research Journal of Recent Sciences* , 4: 3-4.

Parween, T., Jain, S., Mahmooduzzafar and Fatma, T. (2011): Alteration in nitrogen metabolism and plant growth during different developmental stages of green gram (*Vigna radiata* L.) in response to chlorpyrifos. *Acta Physiol Plant*, 33: 2321-2328.

Poudel, D. D., Horwath, W. R., Lanini, W. T., Temple, S. R. and Bruggen, A. V. (2002): Comparison of soil N availability and leaching potential, crop yeilds and weeds in organic, low- input and conventional farming systems in northern California. Agriculture, *Ecosystems and Environment,* 125-137.

Qu, W., Suri, R. P., Bi, X., Sheng, G. and Fu, J. (2010): Exposure of Young Mothers and Newborns to Organochlorine Pesticides (OCPs) in Guangzhou, China. *Science of the Total Environment,* 408: 3133-3138.

Rosen, C. J. and Allan, D. L. (2007): Exploring the benefits of organic nutrient sources for crop production and soil quality. *Hort Technology*, 17 (4): 422-430.

Saladin, G. and Christophe, C. (2005): Physiological side effects of pesticides on non-target plants. Agriculture and Soil Pollution: New Research, 53-86.

Sharma, I., Bhardwaj, R. and Pati, P. K. (2012): Mitigation of adverse effects of chlorpyrifos by 24-epibrassinolide and analyis of stress markers in a rice variety Pusa Basmati-1. *Ecotoxicology and Environmental Safety,* 85: 72-81.

Sharma, S. (2012): Effect of Fertility Levels and Biofertilizers on growth, yeild and quality of Mustard (Arachis hypogaea L). Jobner: SKN University.

Sharma, S., Jat, N. L., Puniya, M. M., Shivran, A. C. and Choudhary, S. (2014): Fertility Levels and biofertilizers on nutrient concentrations, uptake and quality of Mustard. *Ann. Agric. Res. New Serie*s, 35 (1): 71-74.

Snell, F. D. and Snell, C. T. (1949). Nitrites. *Colorimetric Methods of Analysis, 2*: 802-807.

Stolze, M., Piorr, A., Haring, A. and Dabbert, S. (2000): The Environmental Impacts of Organic Farming in Europe. Stuttgart-Hohenheim: University of Hohenheim/Department of Farm Economics.

Suge, J. K., Omunyin, M. E. and Omami, E. N. (2011): Effect of Organic and Inorganic Sources of Fertilizer on Growth, Yeild and Fruit quality of eggplant (*Solanum melongena* L). Scholars Research Library, 3 (6): 470-479.

Swarnam, T. P. and Velmurugan, A. (2013): Pesticide residues in vegetable samples from the Andaman Islands, India. Environmental Monitoring and Assessment, 185 (7): 6119-6127.

Tiyagi, S. A., Azam, S. and Azam, M. F. (2004): Effect of Some Pesticides on Plant Growth, Root Nodulation and Chlorophyll content of Chickpea. Archives of Agronomy and Soil Science, 50 (6): 529-533.

Vasilikiotis, C. (2000): *Can Organic Farming "Feed the World"?* ESPM- Division of Insect Biology. Berkeley: University of California.

How to cite this article:

Alka Kataria and Khan T. I.2018, An assessment of Pesticide Residues and other Parameters in Mustard under Experimental Conditions. *Int J Recent Sci Res.* 9(5), pp. 26781-26786. DOI: http://dx.doi.org/10.24327/ijrsr.2018.0905.2121

****