Forest Exploration And Utilization As A Veritable Market For Rural Development: An Assessment Of Oke-Ako, Nigeria.

Adeniyi, J.O[1]; Olugbamila, O.B[2]; Aboduade, E.O[3], Olufayo, O[4]; Omole, F.K [5]*

1, 2, 3. Department of Urban & Regional Planning, Rufus Giwa Polytechnic, Owo, Nigeria
4, 5. Department of Urban & Regional Planning, The Federal University of Technology, Akure, P.M.B 704
5*Correspondent author: fkyomole@yahoo.co.uk

ABSTRACT: Rural communities are blessed with resources which need to be exploited to achieve rural development. This study focuses on the assessment of forest resources as a developmental strategy in Oke-Ako, Ekiti State, Nigeria. The rate at which the rural areas are being neglected for the development of urban settlements is on the increase. This phenomenon had lead to the increase of urban populace on a daily basis which equally results to other problems. The abundance of forest resource in the study area has brought about an approximate 3994 population; this makes the community to standout among other settlements in the area. The sampling techniques adopted for this study is a total survey. Structured questionnaires were administered to all the 208 buildings in the study area and relevant government agencies. Data collected from the study area were analyzed and presented with the aid of tables and other graphical illustration. Other findings include; exploitation methods of the forest resources, security measures put in place, efforts towards forest resources preservation, and effects of forest resources development among others. Based on the findings, it is therefore recommended that government at all levels should enlighten the farmers and the entire public on the important of forest resource. Also, forest should be preserved and conserved by government and the community at large so that the available forest resources in Oke-Ako can enhance aesthetic and sustainability of the community.
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1. Introduction

Mango (*Mangifera indica* L.) is one of the most popular and economic fruit trees in Egypt. Awide range of insect Specics causes significant damage to Mango trees. Among these pests, *Icerya seychellarum* (Westwood) (Margarodidae: Homoptera) is considered the most destructive pest of mango trees **(Sayed, 2008).** This pest attacks tender shoots, twigs, leaflets, veins of leaves and fruits of mango trees. Usually, this insect weakens the infested plant itself by sucking the sap with the mouth parts causing thereafter deformations by the action of the toxic saliva **(El-Said, 2006).** Severe infestations caused the drying out of the branches and cortical lesions form, yellow and dropping and distortion of the foliage and fruit blossoms, tumor formation, deterioration of the palm and flower abscission, leaf rolling, chlorosis, leaf dropping, shoot twisting and strong malformation of fruits, which remain small and underdeveloped and reduction in general plants vigor and serious damage on mango growth and increasing transpiration, depleting nutrients and destroying chlorophyll, so impairing photosynthesis and productivity and subsequently, cause considerable quality and quantity yield losses and also marketing value of the fruits and even plant death **(Osman, 2005 and Reda *et al.* 2010**); but also due to the excretion of large amount of honey dew that rich in sugars and nitrogenous components, so give good media to sooty molt fungi that increase the inhibition of photosynthesis qualities of the plant **(Mangoud 2000 and Fisheries and Foresty, 2008).**

The objective of investigation is to estimate the relationship between the rate of infestation by *I. seychellarum* during three peaks of insect activity and the percentage of loss in yield of mango during the two successive seasons of (2010/2011 and 2011/2012).

3. Materials and Methods

This investigation was carried out on mango trees at Esna, Luxor Governorate during the two seasons of (2010/2011 and 2011/2012), to clarify the effect of the levels of infestation by *I. seychellarum* on the yield of mango. The variations among different varieties in mealybugs' infestations were not the unique factor affecting the yield. So one mango variety (seedy Balady) has been chosen to conduct this study. Preliminary study revealed that this variety was the most preferable variety for the mealybugs and exposed the highest loss in the yield of mango **(El-Said, 2006; Abd-El-Rahman *et al.*, 2007 and Bakry, 2010).**

Seedy Balady mango trees was similar in vegetative growth such as size, age and height (6-7m). They also labeled and received the normal agricultural practices, without any chemical control treatments. Monthly sample consisted of 200 leaves (20 leaves from each tree) picked randomly from all directions. Samples were immediately collected and transferred to the laboratory in polyethylene bags for examined under a stereomicroscope. The stages of this insect on upper and lower surfaces of leaves individually sorted into alive preadults, adult females and gravid females were counted and recorded. The yield of each tree was assessed.

The objective of the work was to determine the loss of yield of mango trees in relation to the population density of *I. seychellarum* during three peaks of insect activity. The data obtained were statistically analyzed by using simple correlation which the independent variable (X) representing the number of insects per one mango leaf and the dependent variable (y) represented the yield per tree. The simple regression was used to show the variability in the yield that could be caused by infestation during the whole season. Regression coefficient and the partial regression formula which was adopted to find out the simultaneous effects of three peaks of insect activity in October, May and August on the yield of mango. According to **Fisher (1950) and Hosny *et al*. (1972).** The equation of linear regression was calculated according to the following formula:

$Y = a \pm bx$

Where:

Y = Prediction value (Dependent variable)

a = Constant (y - intercept)

b = Regression coefficient

x = Independent variable

This method was helpful in obtaining basic information about the amount of variability in the yield that could be attributed to these infestations, together, which was calculated as percentage of explained variance (%E.V.). The partial regression values indicate the average rate of change in yield due to a unit change in any of the three peaks of insect activity. Statistical analysis in this present work was carried out by computer (**MSTATC Program software, 1980**).

The amount of damage and losses of yield due to scale insects were calculated according to the following equation**:**

$$\%\text{Yield loss} = \frac{A-B}{A} \times 100$$

Which:

A= Yield for uninfested trees**.**

B= Yield for infested trees.

* Average yield of mango for uninfested trees were 245 and 210 kg/tree during the first and second seasons of study, respectively.

3. Results and Discussion

Data represented in Table (1) and illustrated in Figs. (1 and 2) revealed that the yield decreased gradually with increasing the population density of *I. seychellarum* during the first and second seasons of (2010/2011 and 2011/2102), respectively. These results confirmed the inverted relation between the yield of mango and population density in three peaks of insect activity during both seasons. Results of statistical analysis of data in Table (2) revealed that strongly highly significant negative correlation between the yield of mango and the peaks of insect population (r = -0.976, -0.954 and -0.982) and (r = -0.990, -0.991 and -0.989) during the 1st and 2nd seasons, respectively.

It could be concluded that the total population of this insect had three peaks, which were recorded in the May, August and October. These data were agreeable with **El-Borollosy *et al*. (1990), Osman (2005) and Sayed (2008)** in Egypt, however with different host, they reported that the *I. seychellarum* had three peaks per year.

The slopes of the regression lines revealed that a unit change of insect (one insect/leaflet) decreased the yield of mango by (3.6, 6.5 and 4.3%) through the first season (2010/ 2011) and (2.5, 4.1 and 2.3%) through the second season (2011/2012) during October, May and August.

To determine the real effect of the population density of insect on yield of mango, the partial regression, multiple correlation and coefficient of determination values were carried out.

The obtained results showed that the peak of activity of insect in May 2011 was significant positive effect (P.reg value was +6.22) and (t value = +2.34), while was significant negative (P.reg. value = -5.16) and (t value = -2.52) during August 2011. However, in the same table, the partial regression values (P.reg) emphasized insignificant negative relation that was (-2.996, 0.97, -2.03 and -0.29) and the "t value" were (-1.47, -0.82, -1.32 and -0.28) for peaks of insect population in October 2011, October 2012, May 2012 and August 2012, respectively (Table, 3).

Hernandez *et al.* (2002) studied the relationship between the population density of *Aonidiella aurantii* and the yield of citrus trees. They found that Positive correlation was found between fruit infestation and yield loss at harvest between consecutive years. The coefficient of correlation was high and consequently, the fruit infestation in the previous years could be used to predict the present year's infestation.

The estimated partial regression values indicated the presence of a simultaneous effect of the peaks of insect population on the yield of mango in two successive years of 2010/2011 and 2011/2012. The results showed that the combined effect of these peaks of insect activity on yield of mango during the 1st and 2nd years of study was highly significant where the "F" value, was 106.44 and 145.18 respectively for the two seasons of study, (Table, 3). In the same table, the influence of these combined all peaks of insect was expressed as percentages of explained variance (% E.V.) that was 98.2 and 98.6 %for two successive years, respectively.

Table (1): Effect of infestation by *Icerya seychellarum*, during three peaks of population in the two season (2010-2011 and 2011/2012), on the yield of mango trees (Balady variety).

Season	Inspected trees	Yield (kg)	% Yield reduction	Peaks of *I. seychellarum*			
				October infestation insect/leaf	May infestation insect/leaf	August infestation insect/leaf	Average infestation
2010 / 2011	1	235	4.1	14.2	5.1	8.5	9.3
	2	230	6.1	16.0	6.5	9.4	10.6
	3	228	6.9	18.3	8.4	11.4	12.7
	4	222	9.4	20.0	9.2	13.4	14.2
	5	218	11.0	22.0	10.0	14.2	15.4
	6	210	14.3	24.6	11.4	16.2	17.4
	7	200	18.4	25.0	12.1	18.1	18.4
	8	192	21.6	27.4	12.8	18.4	19.5
	9	185	24.5	29.2	13.2	20.4	20.9
	10	175	28.6	30.6	14.5	22.5	22.5
2011 / 2012	1	185	11.9	16.0	6.1	11.4	11.2
	2	180	14.3	17.9	7.3	12.8	12.7
	3	175	16.7	20.2	9.8	15.6	15.2
	4	170	19.0	22.4	11.0	18.5	17.3
	5	162	22.9	24.6	12.2	19.9	18.9
	6	155	26.2	26.9	13.4	22.7	21.0
	7	150	28.6	28.0	14.6	25.6	22.7
	8	148	29.5	30.2	15.2	25.6	23.7
	9	146	30.5	32.5	15.9	28.4	25.6
	10	142	32.4	33.6	17.1	31.2	27.3

Table (2): Simple correlation, partial regression values and linear regression equation when the counts of mealybug, *I. seychellarum*, were plotted versus the yield of mango (2010/2011 and 2011/2012 seasons).

Tested counts	Season	Simple correlation and simple regression values					Regression linear equation
		r	b	t	S.E	p	Y = a + bx
Average No. of individuals / leaf (October)	First	-0.976	-3.609	0.286	12.6	0.000	-3.609 x + 291.53
	Second	-0.99	-2.511	0.124	20.3	0.000	-2.511 x +224.66
Average No. of individuals / leaf (May)	First	-0.954	-6.474	0.72	9.0	0.000	-6.474 x + 276.31
	Second	-0.991	-4.132	0.198	20.9	0.000	-4.132 x + 211.96
Average No. of individuals/leaf (August)	First	-0.982	-4.328	0.293	14.8	0.000	-4.328 x + 275.50
	Second	-0.989	-2.28	0.123	18.5	0.000	-2.28 x + 209.56
General average	First	-0.976	-4.567	0.363	12.6	0.000	-4.567 x + 282.99
	Second	-0.992	-2.801	0.123	22.8	0.000	-2.801x + 216.08

r = Simple correlation b = Simple regression

Table (3): Partial regression, multiple correlation, coefficient of determination values and explained variance when the counts of mealybug, *I. seychellarum*, were plotted versus the yield of mango (2010/2011 and 2011/2012) seasons.

Season	Tested counts	Simple correlation and simple regression values				Analysis variance			
		P.reg	t	S.E	p	F values	MR	R^2	E.V%
First	Average No. of individuals/ leaf (October)	-2.996	-1.47	2.05	0.177	106.4	0.991	0.982	98.2
	Average No. of individuals / leaf (May)	6.82 *	2.34*	2.92	0.044				
	Average No. of individuals / leaf (Augu st)	-5.16*	-2.5*	2.05	0.033				
Second	Average No. of individuals/ leaf (October)	-0.97	-0.82	1.18	0.43	145.2	0.993	0.986	98.6
	Average No. of individuals / leaf (May)	-2.03	-1.32	1.54	0.221				
	Average No. of individuals / leaf (Augu st)	-0.29	-0.28	1.05	0.79				

MR = Multiple correlation P.reg = Partial regression
R^2 = Coefficient of determination E.V% = Explained variance

The previous results indicated that the yield was mostly related to the simultaneous effect of these peaks of insect rather than the single effect of each peak of insect infestation. The results in Table (4)and illustrated in Fig. (1) indicated that the maximum yield (235 and 185 kg) was recorded with the lowest level of population density through the three peaks during the first and second seasons, respectively. While, the minimum yield (175 and 142 kg) was estimated with the highest value of population density in the three peaks during the two seasons, respectively.

Data of both seasons also indicated that the quantity of yield on the first season (2010/2011) was higher than that on the 2^{nd} one (2011/2012). The differences may be attributed to many reasons, such as the reduction of yield resulting from the infestation by pest and fruits depression due to natural causes such as exchange of pregnancy and deficiency of fertilization.

The slope of the regression lines (Table, 5) and illustrated in Figs. (1 and 2) revealed that a unit change of *I. seychellarum* (1 insect/leaf) reduced on the yield by (3.6, 6.5 and 4.3 kg/tree) and (2.5, 4.1 and 2.3 kg/tree) and increased the percentage of the yield loss by (1.47, 2.64 and 1.77 %) and (1.47, 1.97 and 1.08 %), when the yield data were correlated with the

infestation in October, May and August during the two successive seasons, respectively.Similer withos obtained by **Mohamed and Assfor 2004** However, when the yield data were correlated with the general average of infestation for the three peaks, the corresponding values were 4.57 kg/tree and 1.86 % during 2010/2011 season. But, the season of 2011/2012, the corresponding values were 2.80 kg/tree and 1.33 %. These results revealed that the infestation during May was more effective in reducing mango yield during the two seasons. **Bakry (2009)** reported that the early season infestation with I. pallidula during May was more effective causing the greatest loss in mango yield. Also **El-said (2006)** found that At high infestation levels, the feeding of this insect causes serious damage resulting in early leaves drop and yield reduction.

Generally, et can be concluded from the current investigation that the reduction in mango yield was a summation of many factors including level and time of infestation and the ability of variety to infestation. These results are similar to those obtained by **Reddy, *et al.* (1991)** who found a linear relationship between infestation and yield loss, and more increasing in yield loss as a result of the earlier infestation. **Selim (2002)** studied the effect of Maskell scale insect, *Insulaspis pallidula* (Green) infestation on the yield of mango trees. He stated that the yield decreased gradually with increasing the population density of this pest. He added that the yield decreased gradually with increasing the population density of Insulaspis pallidula(Green) in four peacks (September , April , July and Augest).

Table (4): Gradual decrease in yield with increase the rates of infestation by *I. seychellarum* during three peaks (2010/2011 and 2011/2012 seasons, Esna, Luxor Governorate).

Inspected trees		Yield (kg)	October infestation		May infestation		August infestation		General average	
			No. of insects / leaf	Calculated yield	No. of insects / leaf	Calculated yield	No. of insects / leaf	Calculated yield	No. of insects / leaf	Calculated yield
2010 / 2011	1	235	14.2	240.29	5.1	243.29	8.5	238.71	9.3	240.63
	2	230	16.0	233.79	6.5	234.23	9.4	234.82	10.6	234.41
	3	228	18.3	225.49	8.4	221.93	11.4	226.16	12.7	224.99
	4	222	20.0	219.36	9.2	216.75	13.4	217.50	14.2	218.16
	5	218	22.0	212.14	10.0	211.57	14.2	214.04	15.4	212.69
	6	210	24.6	202.76	11.4	202.51	16.2	205.38	17.4	203.58
	7	200	25.0	201.31	12.1	197.98	18.1	197.16	18.4	199.03
	8	192	27.4	192.65	12.8	193.45	18.4	195.86	19.5	193.87
	9	185	29.2	186.16	13.2	190.86	20.4	187.21	20.9	187.49
	10	175	30.6	181.10	14.5	182.44	22.5	178.12	22.5	180.20
2011 / 2012	1	185	16.0	204.48	6.1	186.78	11.4	183.60	11.2	184.76
	2	180	17.9	199.66	7.3	181.73	12.8	180.37	12.7	180.51
	3	175	20.2	194.03	9.8	171.63	15.6	173.91	15.2	173.50
	4	170	22.4	188.41	11.0	166.58	18.5	167.44	17.3	167.64
	5	162	24.6	182.78	12.2	161.54	19.9	164.21	18.9	163.09
	6	155	26.9	177.16	13.4	156.49	22.7	157.75	21.0	157.22
	7	150	28.0	174.34	14.6	151.44	25.6	151.29	22.7	152.39
	8	148	30.2	168.72	15.2	149.12	25.6	151.29	23.7	149.79
	9	146	32.5	163.09	15.9	146.39	28.4	144.83	25.6	144.44
	10	142	33.6	160.28	17.1	141.34	31.2	138.36	27.3	139.61

Table (5): Gradual increase in yield loss with increasing the infestation rate of *I. seychellarum* during three peaks of population densities (2010/2011 and 2011/2012) seasons at Esna, Luxor Governorate.

Inspected trees		% Yield reduction	October infestation		May infestation		August infestation		General average	
			No. of insects / leaf	Calculated reduction	No. of insects / leaf	Calculated reduction	No. of insects / leaf	Calculated reduction	No. of insects / leaf	Calculated reduction
2010 / 2011	1	4.1	14.2	1.93	5.1	0.70	8.5	2.57	9.3	1.79
	2	6.1	16.0	4.58	6.5	4.40	9.4	4.16	10.6	4.33
	3	6.9	18.3	7.96	8.4	9.42	11.4	7.69	12.7	8.17
	4	9.4	20.0	10.47	9.2	11.53	13.4	11.22	14.2	10.95
	5	11.0	22.0	13.41	10.0	13.64	14.2	12.63	15.4	13.18
	6	14.3	24.6	17.24	11.4	17.34	16.2	16.16	17.4	16.90
	7	18.4	25.0	17.83	12.1	19.19	18.1	19.52	18.4	18.76
	8	21.6	27.4	21.36	12.8	21.04	18.4	20.05	19.5	20.87
	9	24.5	29.2	24.01	13.2	22.09	20.4	23.58	20.9	23.47
	10	28.6	30.6	26.07	14.5	25.53	22.5	27.29	22.5	26.44
2011 / 2012	1	11.9	16.0	4.58	6.1	11.06	11.4	12.57	11.2	12.02
	2	14.3	17.9	7.40	7.3	13.46	12.8	14.11	12.7	14.04
	3	16.7	20.2	10.70	9.8	18.27	15.6	17.19	15.2	17.38
	4	19.0	22.4	14.00	11.0	20.68	18.5	20.27	17.3	20.17
	5	22.9	24.6	17.30	12.2	23.08	19.9	21.81	18.9	22.34
	6	26.2	26.9	20.60	13.4	25.48	22.7	24.88	21.0	25.13
	7	28.6	28.0	22.25	14.6	27.89	25.6	27.96	22.7	27.43
	8	29.5	30.2	25.54	15.2	28.99	25.6	27.96	23.7	28.67
	9	30.5	32.5	28.84	15.9	30.29	28.4	31.04	25.6	31.22
	10	32.4	33.6	30.49	17.1	32.70	31.2	34.12	27.3	33.52

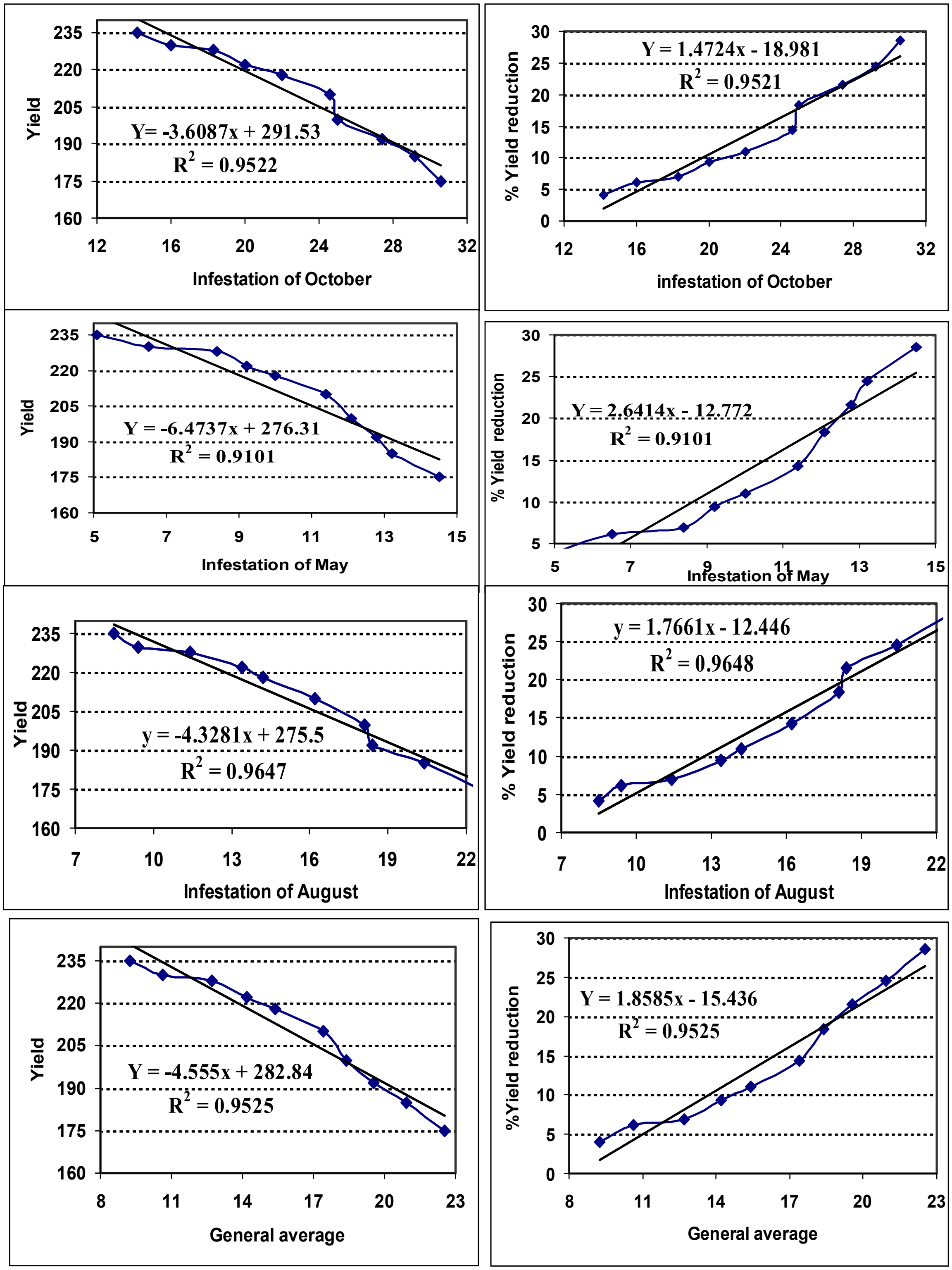

Fig (1): Relationship between population density of *I. seychellarum* and mango yields of the seedy Balady variety during (2010/2011) season.

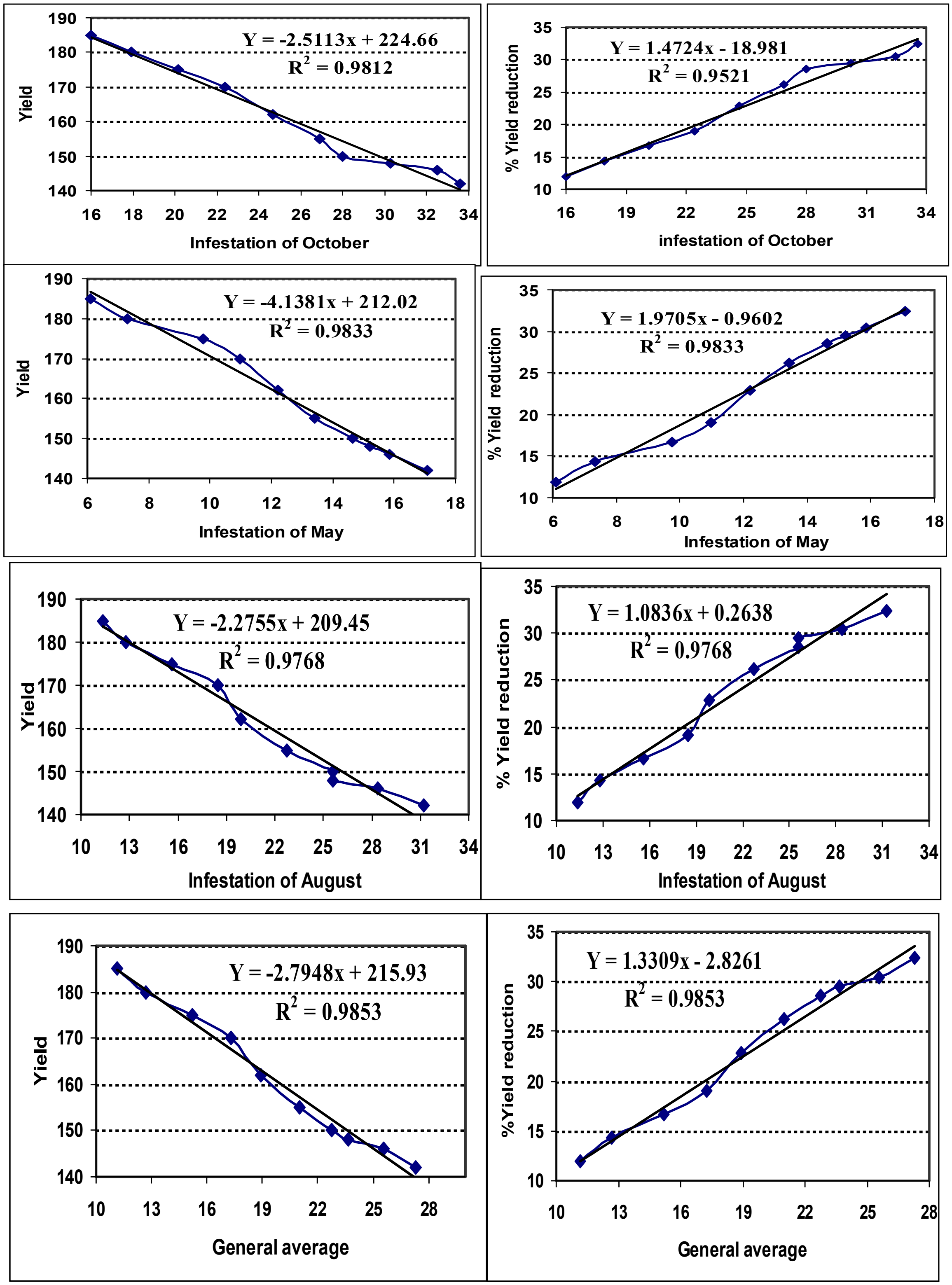

Fig (2): Relationship between population density of *I. seychellarum* and mango yields of the seedy Balady variety during (2011/2012) season.

Corresponding author
Salman, A.M.A
Plant Protection Dept., Fac. of Agric. Sohag Univ., Sohag, Egypt
a26s26@yahoo.com

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