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Full Length Research Paper

Effects of fertilizer phosphorus and poultry droppings treatments on growth and nutrient components of pepper (*Capsicum annuum* L)

Alabi, D. A.

Department of Plant Science and Applied Zoology, Olabisi Onabanjo University, Ago-Iwoye, Nigeria. E-mail: Daalabi2004@yahoo.com.uk.

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The effect of five phosphrous levels (0, 25, 50, 75, 100 and 125 kg/ha) and five poultry dropping (0, 100, 200, 300, 400 and 500 kg/ha) levels on the growth, growth yield, yield components, nutrients concentration and food values of pepper (*Capsicum annuum* L*)* were observed from 2002 to 2003 raining seasons. Phosphrous levels significantly increased pepper plant height, number of leaves per plant, number of branches per plant and leaf area up to 125 kg (p/ha) level. The phosphorus application also significantly increased early flowering, maturity and yield (ton/ha) of the treated plants. Application of organic waste, poultry dropping increased the growth yield and yield components of pepper significantly more than the fertilizer phosphrous. Since poultry dropping is cheap to obtain and enhances the pepper plant performance, it is recommended for use. *C. annuun* was found to contain both the major and minor nutrient elements which can supply the body with necessary ingredients for growth.

Key words: Poultry droppings; caspicum species, nutrient contents, interaction absorption.

INTRODUCTION

Capsicum annuum L. locally called tatase pepper is a very important fruit vegetable in the tropics, and it is commonly used as condiment. Pepper contributes substantially to the Nigerian diet. It is a main constituent of soups and stews. Tatase was reported to contain more minerals than others common peppers in Nigeria (Olaofe et al., 1993) . Nutritionally, paper supplies the body with vitamins and several mineral nutrients. Agusiobo (1976) and Keshinro and Ketiku (1983) reported that vitamin C obtained from pepper is greater than that obtained from tomato.

Peck and MacDonald (1975) reported that pepper produce well when it is adequately supplied with the essential nutrients of fertilizations. Peck et al. (1980) had indicated that the nutritional quality of the edible portion of pepper just like the overall yield should be given adequate consideration in fertilization programme. The few available information gave fertilizer phosphorus (P) ranging from as low as 20 kg P/ha as influencing pepper yield NIHORT (1986) to as much as 140 kg P/ha (Anon, 1987).

Many researchers have made attempt to use recommended fertilizer level for *Capsicum frutescence* which is a crop that is physiologically, botanically biochemically different from *Capsicum annuum,* because its nutrient requirement is much lower to that of *C. annuum* hence, the poor results obtained when used (Enwez et al., 1989). Locassio et al. (1981) reported that yield in pepper increased with increase in nitrogen (N) level. Similarly almost at the same time Batal and Smittle (1981) reported a decline in yield with high levels of N. Except for the reports of Fagbayide (1997) and Babalola and Babalola (1997) little information is available on the response of pepper to phosphrous. This study was carried out in the field to evaluate the response of *C. annuum* to levels of P and poultry droppings using two plant extracts (*Ocimum gratissimum* and *Eucalyptus glabulus*) to prevent the seedlings from attack.

Table 1. Soil Chemical and Physical Properties at the experimental sites.

	2002	2003
pH (H_2O)	5.9	6.3
Total N(%)	0.16	0.15
Organic Carbon %	1.86	1.85
Available P. (mg/kg)	6.9	7.0
Ca^{2+}	2.7	2.5
Mg^{2+}	0.80	0.76
K^{+}	0.40	0.38
Na^{+}	0.37	0.39
Mechanical Analysis		
% Sand	76.4	76.8
% Silt	16.6	14.6
% Clay	9.0	8.6

Soil textural class Sandy loam

MATERIALS AND METHODS

A two year field trial on the effects of fertilizer phosphorus and poultry droppings on the growth and performance of *C. annuum* was conducted. The variety used was 'tatase', whose seeds were obtained from Nigeria Horticultural Research Institute Ibadan. The research was conducted in Ago Iwoye between 2002 and 2003. The seeds were cleaned in 0.1% Mercuric chloride solution for 30 s and rinsed in several changes of sterile distilled water to remove inhibitory materials (Alabi 1995). They were then soaked in sterile distilled water for 3 h to soften the hard seed coat in order to enhance quick germination of the seeds later. Ten nursery trays were filled with sieved sand loam soil in the greenhouse. Seeds were sown in the trays and daily watering was done. Germination counts were made from the 4th day after sowing until six weeks after sowing. The germinating seedlings were tagged to know the age. Transplanting was carried out six weeks after germination during both seasons.

As the pepper seedlings are being raised in the greenhouse, the experimental site behind the College of Agricultural Sciences, Olabisi Onabanjo University, Ago-Iwoye, Latitude 6^0 50"N and longitude 3^0 50"E was prepared ready for transplanting. The site is characterized by an annual rainfall of about 1300 mm and a mean temperature of 22.5^0C. The relative humidity is 70 – 85% during wet season and 56 – 70% during dry season. Composite samples of the top soil (0-30 cm deep) were taken from the site and analyzed for their physical and chemical properties (Table 1) using the standard procedure described by Black (1965).

Each year the experimental site was ploughed once and harrowed twice at the onset of the rains. In each year beds of 1.2 m x 4.0 m were made. A total of 36 beds separated by 0.5 m each were made to represent six levels of fertilizer P and six levels of poultry droppings treatments each replicated three times. The fertilizer P levels used were 0, 25, 50, 75, 100 and 125 kg p/ha. The phosphorus source was single superphosphate (18% P_2O_5) and this was applied during the land preparation in each year. Urea and potash were top dressed at 60 kg N/ha and 30 kg K/ha, respectively. The levels of poultry droppings used were 0, 100, 200, 300, 400 and 500 kg/ha. The levels were applied during land preparation. Seedlings were transplanted in April, 2002 and May, 2003 respectively. The spacing used was 60 x 60 cm on beds to give a total plant population of 12 stand per bed and 26,000 plants per hectare (Fagbayide, 1997).

All the treatments were arranged to fit into a randomized complete block design. The plots were kept weed- free after transplanting through regular weeding. Extracts of *Ocimum gratissimum* and *Bryophyllum pinnatus* were used to spray the plants against defoliating insects and microorganisms at regular intervals. The parameters measured included plant height number of leaves and branches per plant. These were determined *in situ* from five randomly sampled plants from the net plot using the partial replacement procedure of Gomez and Gomez (1984). The leaf area was determined using the punch method. Records of number of fruit per plant, fruit fresh yield per plant were taking on fortnight basis beginning from 4 weeks after transplanting (WAT). Fresh yield/ha was obtained through conversion of the net plot yield. The fruit length and diameter were recorded from 20 randomly selected fruits. Days to 50% flowering and maturity were recorded on plot basis. At the end of each year, ripe fruits were harvested and dried in an oven at 100^0C first, for 24 h and later to constant weight. The dried seeds were milled into powder form and kept in the incubator for analysis later.

Part of the powdered form was used for analysis. The analysis was carried out using the method of Hack (2000) as described by Alabi et al. (2004) and Alabi and Akinsulire (2005). The N levels of the samples were determined using the micro-Kjetdahl method (Kirk, 1950). The protein content was determined using the nitrogen level by conversion factor of 6.25 (Mckee, 1962; Osborne and Voogt, 1978). The crude fat was determined using the methods described by AOAC (1999) and Hussan and Spanner (1964). Soluble carbohydrates were extracted using the 80% ethanol method described by McCready et al. (1950). The main value was determined using the anthrone method of Witham et al. (1971). The saponification value, acid value and iodine value were determined using the method described by Alabi and Akinsulire (2005).

All the data obtained were subjected to analysis of variance as described by Sneadecor and Cochran (1967). Main effects and their interactions were determined using the method of Gomez and Gomez (1984). Multiple comparisons of treatment means were done using Duncans Multiple Range Test (Duncan, 1965). Regression analysis was carried out and the levels of the nutrients were determined using the method of Garg and Bansal (1972).

RESULTS

The precropping soil analysis showed the soil to be sandy loam and very low in chemical nutrient analysis (Table 1). Mean plant response to P in terms of plant height measured from 6 WAT showed progressive increase up to 100 kg P/ha before a non-significant decline was seen at 125 kg P/ha (Table 2). The poultry droppings increased the plant height in both seasons. The increase of plant growth in both treatments was significantly higher than the control (Table 2). The leaf area and number of branches were both significantly

($p \leq 0.05$) increased with increase in the levels of both P and poultry droppings when compared with the control values (Table 3). However, 125 kg P/ha did not increase the leaf area and number of branches significantly than 100 kg P/ha in both years. Same was observed in seedlings treated with poultry dropping of 400 and 500 kg/ha treatments (Table 3).

Table 2. Plant height of pepper as affected by Phosphorus and Poultry dropping levels.

Treatment Kg/p/ha	Plant Height (cm)					Plant Height (cm)				
	2002					2003				
	4WAT	6WAT	8WAT	10WAT	12WAT	4WAT	6WAT	8WAT	10WAT	12WAT
0	13.12^{e}	23.72^{d}	28.62^{d}	34.58^{d}	34.60^{d}	14.56^{d}	22.60^{e}	28.70^{e}	33.92^{d}	33.92^{d}
25	15.02^{c}	25.02^{c}	29.62^{c}	36.85^{c}	36.86^{c}	16.25^{c}	24.76^{d}	30.33^{d}	35.81^{c}	35.81^{c}
50	17.21^{b}	28.25^{b}	34.51^{b}	38.62^{b}	38.62^{b}	17.62^{b}	26.74^{c}	32.65^{c}	36.75^{b}	36.80^{b}
75	18.31^{a}	30.22^{a}	35.62^{a}	39.32^{a}	39.33^{a}	19.05^{a}	36.22^{a}	38.74^{b}	39.36^{a}	39.40^{a}
100	18.86^{a}	30.30^{a}	36.02^{a}	39.86^{a}	39.86^{a}	18.65^{b}	34.62^{b}	39.65^{a}	39.80^{a}	39.81^{a}
125	14.01^{d}	24.01^{d}	28.65^{d}	33.36^{e}	34.42^{d}	15.62^{c}	20.45^{f}	27.42^{f}	30.35^{e}	30.66^{e}
S.E	1.121	1.324	1.701	1.736	1.736	1.107	1.212	1.362	1.416	1.416
Poultry droppings (Kg/ha)	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**
0	13.65^{d}	16.05^{d}	23.72^{e}	26.76^{d}	26.77^{d}	14.25^{d}	16.65^{d}	24.02^{e}	27.72^{d}	27.77^{c}
100	17.27^{c}	21.36^{c}	31.62^{d}	39.80^{c}	40.01^{c}	17.62^{c}	21.65^{cd}	32.65^{d}	40.72^{c}	40.73^{b}
200	17.92^{e}	22.30^{b}	33.85^{c}	40.76^{b}	40.92^{c}	18.05^{ab}	22.43^{c}	34.72^{c}	41.35^{b}	41.35^{b}
300	18.86^{b}	23.01^{b}	34.21^{b}	42.62^{a}	42.63^{b}	18.90^{b}	24.32^{b}	36.72^{b}	41.65^{b}	41.66^{b}
400	21.36^{a}	23.62^{a}	34.26^{b}	43.21^{a}	43.64^{a}	20.56^{a}	24.72^{b}	36.80^{b}	41.72^{b}	41.72^{b}
500	21.66^{a}	23.80^{a}	35.01^{a}	43.22^{a}	43.65^{a}	20.82^{a}	25.05^{a}	37.62^{a}	42.65^{a}	42.66^{a}
S.E	0.812	0.825	0.845	0.905	0.905	0.712	0.736	0.505	0.901	0.901

Means followed by unlike alphabet(s) within a treatment column and period are significantly different DMRT(P=0.05).

Increase in the levels of both P and poultry dropping treatments significantly enhanced fresh fruit yield per plant when compared with the control values (Table 4). This also enhanced, significantly, the yield per hectare with the highest yield value from pepper seedlings treated with poultry droppings. The yield components were increased as the level in P and poultry dropping treatments were increased in both treatments. The fruit length and diameter were significantly increased, while days to 50% flowering and days to maturity were significantly reduced as the treatment levels increase in both years (Table 5) . Both P and poultry dropping treatments significantly increased the number of fruits per plant in both years, with poultry dropping treatment gaving the highest number of fruits per plant (Table 5).

Predicted yield was maximized at 25 kg P/ha and 400 kg poultry droppings/ha. Considering the cost of fertilizer and price of pepper, the optimum yield was obtained at 400 kg poultry droppings/ha and 75 kg P/ha (Table 6).

Increase in the levels of P increased the nutrient elements contents of pepper from 6 WAT to 12 WAT. Similarly, treatment of pepper seedlings with increase in levels of poultry droppings significantly increased the nutrient element contents of pepper than P treatments (Table 7). *C. annuum* contains protein, carbohydrates, fats and oil and oil characteristics such as saponification, iodine and acid contents are presented in Table 8. Increase in the levels of P and poultry droppings significantly increased the value of the food contents and oil characteristics, while reducing the acid value (Table 8).

DISCUSSION

The initially low response of pepper to P treatment may be due to low P absorption by pepper. The subsequent increase in plant height from 4 WAT to 12 WAT may be attributed to enough rainfall which would have increased the solubility of the nutrients, thus making the nutrients to be easily absorbed by the roots leading to good response. Fagbayide (1997) had earlier reported that there was no plant height increase beyond 10 WAT which is different from our observation of increase beyond up to 12WAT before a decline was observed. Previous workers reported that fertilizer P ranging as low as 20 kg P/ha influenced greater pepper yield (NIHORT, 1986) to as high as 140 kg P/ha (Anon, 1987). The ability of P at 100 and 125 kg (p/ha) to improve on the plant height, numbers of leaves and branches per palnt as reported in this investigation confirm the earlier reports.

The development of flowers started 6 WAT and continued till 12 WAT before a sharp decline was observed. This observation agrees with the report of Fagbayide (1997). The flowers developed into fruits which were ‘Cubanelle’ shaped, a characteristic feature of *C. annuum* ‘tatase’ as reported by Messiaen (1992). The fruit count showed positive and significant response to P application. This result disagrees with that of Fagbayide (1997). However, the observation by Fagbayide (1997) that the highest mean number of fruits was obtained from 20-100 kg P/ha agrees with the reports of this work. Messiaen (1992) reported that pepper required very limited moisture and relative

Table 3. Leaf area and number of branches of pepper analysis as affected by phosphorus and poultry dropping levels.

	Leaf area (cm^2) 2001 + 2002 (POOLED)					Number of branches 2001 + 2002 (POOLED)				
	2002					2003				
Treatment Phosphorus kg ^{P}/ha	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**
0	1.7^{c}	3.2^{d}	5.8^{e}	6.0^{f}	5.6^{f}	3.16^{d}	9.33^{c}	10.75^{e}	10.88^{e}	10.83^{f}
25	3.0^{bc}	6.2^{c}	6.9^{d}	7.5^{e}	8.0^{e}	3.82^{c}	10.35^{c}	13.28^{d}	14.62^{d}	12.65^{d}
50	3.6^{b}	7.6^{b}	8.5^{c}	10.6^{d}	10.7^{d}	4.72^{bc}	11.62^{b}	20.15^{e}	22.25^{c}	21.85^{c}
75	4.3^{ab}	8.9^{a}	11.5^{b}	12.6^{c}	12.8^{c}	5.01^{b}	11.85^{b}	23.85^{b}	24.62^{b}	24.63^{b}
100	4.9^{a}	8.8^{a}	14.5^{a}	16.8^{a}	17.0^{a}	5.75^{a}	13.01^{a}	30.92^{a}	31.92^{a}	31.92^{a}
125	5.0^{a}	9.2^{a}	15.0^{a}	15.9^{b}	16.1^{b}	6.00^{a}	13.06^{a}	30.95^{a}	31.99^{a}	31.99^{a}
S.E	0.075	0.148	0.286	0.288	0.254	0.508	0.782	1.305	1.309	1.299
Treatment Poultry droppings (Kg/ha)	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**	**4WAT**	**6WAT**	**8WAT**	**10WAT**	**12WAT**
0	1.6^{d}	3.3^{e}	4.9^{e}	6.2^{e}	6.0^{e}	3.10^{d}	9.25^{d}	11.05^{e}	11.65^{e}	11.60^{e}
100	3.3^{c}	6.9^{d}	9.8^{d}	11.6^{d}	11.9^{d}	5.82^{c}	11.45^{c}	14.58^{d}	16.52^{d}	16.53^{d}
200	4.6^{b}	8.5^{c}	11.2^{c}	15.6^{c}	16.2^{c}	6.61^{b}	11.59^{b}	21.25^{c}	22.85^{c}	22.90^{c}
300	5.4^{a}	9.8^{b}	13.5^{b}	16.6^{b}	17.6^{b}	7.21^{a}	12.42^{b}	22.25^{b}	24.82^{b}	25.01^{b}
400	5.8^{a}	10.5^{a}	16.8^{a}	17.2^{a}	19.8^{a}	7.95^{a}	14.21^{a}	23.28^{a}	32.01^{a}	32.61^{a}
500	5.6^{a}	10.6^{a}	16.9^{a}	17.2^{a}	19.9^{a}	7.86^{a}	14.32^{a}	23.50^{a}	32.01^{a}	32.71^{a}
S.E	0.062	0.121	0.252	0.246	0.234	0.51	0.792	1.025	1.112	1.112

Means followed by unlike alphabet(s) with a treatment and period are significantly different DMRT(P=0.05).

Table 4. Fresh fruit yield of pepper as affected by Phosphorus and Poultry manure

Treatment Phosphorus (Kg/p/ha)	**2001 + 2002 (POOLED) Yield / Plant (g)**			**2001 + 2002 (POOLED) Yield per Hect. Are in (tons)**		
	2001	**2002**	**POOLED**	**2001**	**2002**	**POOLED**
0	180.5^{e}	178.7^{d}	179.6^{f}	5.16^{d}	6.26^{d}	5.71^{e}
25	280.6^{d}	290.6^{cd}	285.6^{e}	7.05^{c}	8.96^{c}	8.02^{d}
50	296.5^{cd}	295.4^{c}	295.85^{d}	9.25^{bc}	13.89^{ab}	11.07^{c}
75	298.6^{cd}	1302.3^{b}	300.55^{c}	10.50^{b}	14.38^{a}	12.44^{ab}
100	300.5^{b}	311.5^{a}	306.0^{b}	11.28^{a}	14.65^{a}	12.97^{ab}
125	310.6^{a}	318.5^{a}	314.55^{a}	11.50^{a}	14.70^{a}	13.10^{a}
LSD (0.05)S.E	**30.576**	**30.664**	**28.62**	**0.76**	**0.601**	**0.653**
Poultry dropping (Kg/ha)						
0	180.7	180.6	18.7	5.46	6.66	6.06
100	285.7	292.6	289.15	9.15	12.1	10.63
200	300.6	301.7	309.65	10.35	15.65	13
300	305.5	315.5	311.50	11.62	16.74	14.18
400	320.6	325	322.80	12.96	17.25	15.11
500	325.2	328.6	326.90	12.98	17.28	15.13
LSD (0.05)S.E	**27.65**	**27.8**	**26.65**	**0.67**	**0.516**	**0.563**

Means followed by unlike alphabet(s) within a treatment column and period are significant different at (P=0.05) using DMRT.

humidity during flowering and fruiting stages. This is because of the short height of 'tatase' plants and the heavy fruits being produced. Staking is used to prevent the branches from touching the ground enhanced large fruit production.

Under the compound traditional farming systems, pepper production enjoys maximum benefit of organic manure from household refuse for soil fertility maintenance. Poultry dropping contains large contents of all the mineral nutrients needed by the plant (Alabi 2001, 1995). Dibb et al. (1990) reported the role of N and P in crop fertilization leading to increased absorption of both elements, have been attributed to increased top growth, particularly as a result of N absorption. The res-

Table 5. Yield Components in Pepper as Affected by Phosphorus x Poultry Droppings Levels.

Leaf area (cm^2) 2001 + 2002 (POOLED) 2002					
Treatment Phosphorus kg (p/ha)	**Days to 50% Flowering**	**Days to maturity**	**Fruits length (cm)**	**Fruit diameter (cm)**	**Number of fruits per plant**
0	70.3^{a}	130.6^{a}	5.64^{c}	2.61^{c}	13.05^{c}
25	70.05^{ab}	130.4^{a}	6.72^{bc}	3.18^{b}	14.36^{bc}
50	68.20^{b}	126.8^{b}	7.05^{b}	3.40^{ab}	14.96^{bc}
75	64.32^{c}	120.6^{c}	7.95^{ab}	3.78^{ab}	15.50^{b}
100	61.50^{d}	120.0^{c}	8.50^{a}	4.05^{a}	15.62^{a}
125	61.26^{d}	119.20^{c}	8.90^{a}	4.10^{a}	15.70^{a}
LSD (0.05) S.E	**0.516**	**0.782**	**0.048**	**0.036**	**0.326**
Poultry droppings (Kg/ha)					
0	76.2^{a}	133.5^{a}	5.66^{c}	2.66^{c}	13.10^{d}
100	73.8^{b}	131.6^{ab}	6.92^{b}	3.50^{b}	15.26^{c}
200	70.4^{c}	126.7^{b}	7.45^{ab}	3.60^{b}	16.36^{b}
300	65.8^{d}	124.6^{b}	7.96^{ab}	4.21^{a}	19.40^{ab}
400	64.4^{e}	123.9^{c}	8.36^{a}	4.56^{a}	19.86^{a}
500	64.4^{e}	123.9^{c}	8.45^{a}	4.06^{a}	19.90^{a}
LDS (0.05) S.E	**0.416**	**0.768**	**0.054**	**0.04**	**0.363**

Means followed by unlike alphabet(s) within a parameter are significant different at 5% level using DMRT.

Table 6. Phosphorus x Poultry droppings interaction on plant height and fruit number.

Treatment Phosphorus (p/kg/ha)	**Plant height 2001**						**Fruit number 2002**					
	Poultry Droppings (kg/ha)						**Poultry Droppings (kg/ha)**					
	0	100	200	300	400	500	0	100	200	300	400	500
0	17.26^{e}	18.62^{f}	21.25^{g}	23.65^{gh}	26.25^{h}	26.35^{h}	5.60^{fg}	5.65^{fg}	5.72^{fg}	5.88^{fg}	6.25^{f}	6.28^{f}
25	22.68^{i}	27.52^{k}	29.20^{jk}	30.70^{j}	41.28^{i}	41.40^{i}	8.10^{g}	10.05^{fg}	10.55^{f}	12.36^{ef}	12.56^{e}	12.58^{e}
50	25.82^{h}	33.85^{g}	35.70^{ef}	37.81^{f}	48.42^{e}	48.63^{e}	14.20^{f}	15.62^{e}	16.21^{de}	16.75^{de}	17.62^{d}	77.69^{d}
75	39.63^{e}	36.92^{f}	44.62^{de}	46.50^{d}	50.31^{c}	50.36^{c}	18.70^{cd}	18.90^{cd}	18.95^{cd}	19.25^{c}	19.50^{c}	19.50^{c}
100	40.82^{d}	41.21^{d}	47.62^{c}	50.35^{b}	53.84^{be}	54.66^{b}	19.45^{bc}	19.62^{bc}	19.96^{bc}	20.25^{b}	20.45^{b}	20.46^{b}
125	44.95^{d}	47.25^{c}	48.81^{c}	51.30^{bc}	54.01^{ab}	55.0^{a}	19.60^{ab}	19.89^{ab}	20.62^{a}	20.75^{a}	20.95^{a}	20.95^{a}
S.E.	**1.201**						**0.524**					

Means followed by different alphabet(s) with a parameter are significantly different at 5% level using DMRT.

earchers also reported that P increased the N content of legumes by improving the modulation. Nitrogenous compounds make up a significant part of the total weight of plants, similarly increase in nitrogen supply leads to utilization of carbohydrates to form protoplasm and more cells to enhance growth.

These confirm the ability of poultry droppings to supply the required N contents needed by pepper plants to enhance their growth and general performance. The poultry droppings at the different levels of treatments significantly enhanced the plant height, number of leaves per plant, number of branches, the leaf area, days to 50% flowering, days to maximum flowering, fruit length and diameter, number of fruits per plant, yield per plant and yield/ha (tons), as observed in this work.

The flower formation was reported to be affected by nutrition (Aliyu et al., 1996). Fruit size was positively influenced significantly using poultry droppings. This could be as a result of adequate supply of nitrogen by the poultry droppings to the plant. The increase in the number of leaves would increase photosynthetic surfaces and the current photosynthates produced would enhance the physiological activities leading to production of more assimilates used to significantly increased fruit production, fruit size and fruit diameter. This observation agrees with the report of Addict and Lynch (1959) who reported that plants well supplied with N have longer leaf retention and lower rate of flower and fruit abortion.

Blackman (1919), described plant growth as an example of the operation of compound interest since the growth increment in early period adds to the capital available for subsequent growth. The performance of

Table 7. The Mineral Nutrient Components of Pepper as affected by Phosphorus and Poultry Dropping Levels (mg/100g).

Treatment Phosphorus (Pkg/ha)	N	P	K	Ca	Mg	Mn	Fe	Cu	Na	Zn
0	1.2^{U}d	0.6^{U}d	146.6^{U}e	11.9^{U}e	122.5^{U}e	19.5^{U}e	14.1^{U}e	6.01c	41.80f	1.40e
25	1.8^{U}bc	0.9^{U}c	399.8^{U}d	14.8^{U}d	170.4^{U}d	20.3^{U}d	16.2^{U}d	6.82bc	50.60e	3.80cd
50	2.2^{U}ab	1.4^{U}ab	458.2^{U}c	17.4^{U}c	172.6^{U}c	21.6^{U}bc	18.4^{U}c	7.45bc	58.50d	4.30c
75	2.8^{U}a	1.6^{U}ab	540.8^{U}b	18.6^{U}b	298.8^{U}b	22.4^{U}b	23.6^{U}b	7.89ab	68.60c	5.40ab
100	2.9^{U}a	1.7^{U}a	650.5^{U}a	18.9^{U}a	335.4^{U}a	22.3^{U}ab	30.5^{U}a	8.22a	70.40b	5.80a
125	2.9^{U}a	1.7^{U}a	651.0^{U}a	19.1^{U}a	335.6^{U}a	23.2^{U}a	30.5^{U}a	8.20a	71.50a	5.80a
LSD (0.05) S.E	**0.5**	**0.2**	**30.6**	**1.6**	**11.2**	**0.3**	**1.8**	**0.1**	**2.9**	**0.8**
Poultry droppings (Kg/ha)										
0	1.30d	0.90d	150.60f	11.6e	120.60e	19.5e	13.50f	5.96e	40.90e	1.60d
100	2.40c	1.40c	406.20e	13.9d	180.90d	20.8d	16.90e	7.21d	49.60d	4.24c
200	3.60b	2.80ab	466.80d	18.8bc	188.50c	24.7c	19.60d	9.26bc	60.50c	4.20c
300	4.20ab	2.80ab	496.70c	19.9b	300.60b	28.6b	26.50c	10.20ab	70.60b	6.52b
400	4.80a	3.20a	670.50b	20.6ab	350.60a	30.5a	31.80b	10.95a	73.20a	7.46a
500	4.70a	3.20a	672.20a	21.4a	350.80a	30.8a	35.90a	10.89a	73.35a	7.86a
LDS (0.05) S.E	**0.7**	**0.3**	**22.4**	**1.8**	**11.6**	**0.5**	**1.6**	**0.2**	**3.6**	**0.7**

Means followed by different alphabet(s) within a treatment column and parameter are significantly different at P=0.05 using DMRT

Table 8. Food Contents and Oil Characteristics in Pepper as affected by Phosphorus and Poultry Dropping Levels.

Treatment Phosphorus kg (p/ha)	6 Iodine Value mg/100g	1 Protein	2 Carbohydrate	3 Fats and Oil	4 Saponification Value mg/100g	5 Acid Value mg/100g
0	19.06^{ab}	9.25^{e}	12.96^{d}	9.86^{bc}	900.61^{f}	5.08^{a}
25	19.82^{a}	12.05^{d}	28.25^{c}	10.20^{b}	105.62^{e}	4.22^{ab}
50	19.99^{a}	14.30^{c}	30.25^{ab}	10.32^{b}	110.63^{d}	4.20^{ab}
75	20.01^{a}	16.22^{b}	29.65^{ab}	12.46^{a}	115.72^{c}	3.65^{c}
100	20.05^{a}	20.32^{a}	31.24^{a}	14.36^{a}	118.96^{b}	3.60^{c}
125	20.10^{a}	20.35^{a}	31.28^{a}	14.38^{a}	120.66^{a}	3.15^{cd}
LSD (0.05) S.E.	0.643	1.051	1.342	0.65	11.62	0.034
Each data is a Mean of 4 replicates. Means followed by different alphabet are significantly different at P=0.05 using DMRT						
Poultry droppings (Kg/ha)						
0	18.65^{d}	9.30^{d}	11.95^{d}	9.30^{e}	101.25^{e}	4.25^{a}
100	20.89^{c}	14.95^{e}	32.65^{c}	11.85^{d}	110.60^{d}	3.60^{b}
200	22.25^{b}	17.62^{ab}	36.38^{b}	13.36^{c}	115.60^{c}	3.40^{b}
300	22.25^{b}	18.70^{b}	40.56^{a}	16.85^{b}	120.62^{b}	3.22^{b}
400	23.01^{a}	23.05^{a}	40.42^{a}	17.93^{a}	125.62^{a}	2.65^{c}
500	23.05^{a}	23.20^{a}	40.96^{a}	17.90^{a}	125.80^{a}	2.62^{c}
LDS (0.05) S.E.	0.564	1.002	1.211	0.52	10.162	0.022
Each data is a Mean of 4 replicates. Means followed by different alphabet(s) with a parameter are significantly different at 5% level using DMRT						

pepper plants by the different levels of P and poultry droppings might have been enhanced by the use of botanical extracts used to spray the plants from time of transplanting till the end of the experiment. The extracts of *Ocimum gratissimum* and *Eucalyptus globulus* have been used as insect repellant (Sofowora, 1984). These extracts have been used to eliminate *Pythium aphanidermatum* causing mill dew in plants (Oluma and Garba, 2001) and reduce the attack of *Sclerotium rolfusil* on cowpea (Tripathi et al., 1986).

Pepper (tatase) was found to be rich in nutrient elements as previously reported by Aliyu and Olanrewaju (1996). Analysis of the oil characteristics showed that the pepper contains less acid, moderate amount of iodine and high saponification value showing the oil is edible.

It must be noted that the response of crop to fertilizer and poultry dropping treatments could be modified or affected by season of cropping and edaphic factors. However, efforts must be made to adjust these factors by using staking especially in pepper plantations and making use of plant extracts, which is cheap and noncompetitive, to control plant diseases. Even though maximum yields were obtained at high levels of P and poultry droppings used, the levels at which economic returns are optimum should be used.

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