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WEED AND ISNTECT MANAGEMENT AS INFLUENCED BY WEEDING AND NEEM LEAF EXTRACT SPRYING REGIMES IN THE SUDAN SAVANNA

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ABSTRACT

Field trials were conducted in 2016/2017, 2017/2018 and 2018/2019 dry seasons at Zakirai (12° 60'N, 8°53'0E), Gabasawa Local Government, Kano State to study the response of sweet pepper cultivars (Capsicum annuum L) to weeding and spraying regimes using neem leaf extract in the Sudan savanna. The experiment consisted of four cultivars of sweet pepper (Dan Alko, California Wonder, Dan Damasak and Yolo Wonder), three hoe weeding Weedy check, weeding at 3 and 6 weeks after transplanting (WAT) and four spraying regimes (0, 4, 6 and 8 weeks after transplanting) which were factorially combined and laid out in a split plot design. Data were collected on weed components such as weed cover score, weed dry weight, weed density and weed control efficiency, and on damage caused by insects on pepper. The results of this study revealed that weeding regimes had significantly affected weed density, weed dry weigh and weed cover score. The Weedy check plot consistently recorded the highest weed cover score, weed dry weight, weed density and the lowest was recorded in weed control efficiency. The use of neem leaf extracts was found to be effective only on weed control efficiency.

Keywords: Cultivars; Weeding; Spray; Seasons.

INTRODUCTION

Sweet pepper (Capsicum annuum L), also called bell pepper and "*tattasai*" in hausa language belongs to the family Solanaceae (Olarewaju and Showemino, 2006; Kabura et al., 2008).It is an important vegetable crop all over the world, which ranks third in world vegetable cycle after tomato and onion (Peet, 2006).It is estimated that more than 3 million hectares of Capsicum are grown around the world (Peet,2003) and mostly in the tropics and subtropics (Aliyu, 2000) such as Malaysia East Africa central and West Africa, Caribbean and Philippines. Capsicum consists of five domesticated species which include C. annum, C. baccatum, C. chinensis, C. pubescens and C. frutescens (Bosland and Vatava, 2000). In 2007 over 26,000,000 metric tons were produced globally (U.S. Department of agriculture, 2008). China ranked first, producing more than 50% of the worlds pepper, while United States ranked sixth with about 855,000 metric tons. In Nigeria, sweet pepper has been grown for many years by peasant farmers in the northern part of the country (Olarewaju and Showemino, 2003) and Nigeria is known to be one of the major producers of pepper in the world accounting for about 50% of the African production (Idowu-Agida et. Al., 2010) The crop can be grown on many kinds of soils ranging from fine sands through clay loams and silt loams, but sandy loams and loams are preferred. Peppers were classified as day neutral plants (Eguchi, 1958). Optimum growth temperature ranges from 21-25°C (Grubben, 1977), low to moderate rainfall of 635 to 1200mm per annum is adequate for the crop. Pepper production constraints are attributed to a number of factors that include poor weed management, insect pest and diseases (Jalya and Sani, 2010). Although the crop is widely cultivated through the year, yields obtained by peasant farmers are often very low (Adigun, 2001). Weeds are some of the constraints in sweet pepper production which can substantially reduce yield without obvious sign of damage (Terry, 1983). Weeds are a serious negative factor for crop production, that may result in great losses in crop yield. Such losses may arise mainly from the direct competition between crops and the weeds for light, water, space and nutrient or indirectly from harboring insects and disease causing organisms (Ghulam and mir, 2006). Farmers however do not give desired attention to the number of weedings and the time at which these weedings are to be done toward achieving optimum yield (Olsen et. Al., 2004). In line with this, this experiment was conducted to determine the response of pepper to different weeding regimes and to evaluate the efficiency of neem leaf extract spray in the management of insects in sweet pepper production.

MATERIALSANDMETHODS

Experiment Site

The experiment was conducted during the 2016/2017, 2017/2018 and 2018/2019 dry seasons at Zakirai (12° 60' N; 8° 53' 0" E) Gabasawa Local Government Area, Kano State. A sixteen grams(16g) of weighed sample of fresh leaves from neem tree was dried under a shade.A

DATA COLLECTION

Weed Density

Weed was harvested from 1m x 1m quadrant placed randomly in each net plot at harvest.

Weed Cover Score

The weed cover score was taken at physiological maturity by visual observation on scale of 1-5, where 1 represents uncovered plots, 2=20% covered with weeds, 3=40% covered, 4=60% covered, while 5 represent 80% and above covered with weeds.

Weed Dry Weight (g)

The weed samples obtained from the above was clean, free of soil and oven dried at 70°C to a constant weight. The dry weight was extrapolated to Kg/ha and recorded as per treatment.

Weed Control Efficiency

Weed Control Efficiency was calculated on population/density per unit area described by Mani et. al., (1983) using the following equation:

$$WCE\% = \frac{WDc - WDt}{WDc} X100$$

Where WDC is the weed density (number/m) in control WDt is the weed density (number/m) in the treated plots

INSECTDATA

Damage Caused by Insects

These were assessed by visually observing the damages caused by insect on leaves and at harvest on fruits.

Affected Leaves Plant^{-1}

This was obtained by observing the plots to assess the disease on leaves, then three plants were tagged, and the affected leaves counted and recorded as per treatment.

Unaffected Leaves Plant^{-1}

The unaffected leaves were obtained from the above by counting the remaining unaffected leaves from the three tagged plant and the average was recorded.

Affected Fruits

The affected fruit were obtained by counting the damaged fruits on per plant basis after each harvest and the average was recorded.

Unaffected Fruits

The remaining unaffected fruit were counted at each harvest and the average thereafter recorded on per plant basis.

DATA ANALYSES

Data generated were subjected to analysis of variance using general statistics computer software (Genstat) 17th edition. Analysis of variance (ANOVA) for all measurements was performed using SAS software package 2003 version.

RESULTS AND DISCUSSION

The bioactive compound of neem (table 1) revealed the presence of Salanin azadiractin (22.4%), Gedunin(18%),hydroquinone (4.4%), luteolin-7-sulfate(13.8%), nimbolide (17.5%), nimbinine (18.2%) and Glutamine (5.5%). This had detected seven peaks their retention time of 11.6, 13.2, 1.7, 1.7, 1.9, and 13.2 and 1.3. The peak separation was 1.0 the organic chemical compounds were identified and characterized based on their molecular weight. The effect of year, variety, weeding and spray on weed cover score, weed dry weight, weed density and weed control efficiency in sweet pepper at Zakirai is presented in stable 2. It was observed that season significantly affects all the weed components. This showed that 2016 had the highest weed cover score while 2017 season had the lowest. Weed dry weight was higher in 2017 season and lowest in 2018 season. Statistically similar and higher weed density were recorded in both 2016 and 2018 dry season than 2017. Weeding regimes has significantly affected weed cover score, weed dry weight and weed control efficiency with the weedy check plot consistently recorded the highest weed cover score, weed dry weight, weed density and lowest weed control efficiency. The significant increase that exists for weed cover score, weed dry weight and weed density may be due to the reason that the weedy check plots were densely populated with weeds and most of the weeds regenerated shortly after first weeding. Weed dry weight was significantly higher in weedy check plots probably due to high proficiency of weed which continue to germinate at the expense of the crop. Similar observations were made by Garko et. al., (2016), Kausar et. al, (2019) and Bolaji and Emmanuel (2015) in which they separately reported hat weedy check control plots resulted in increased weed germination which translated into higher weed density and weed dry weight. The significant effect of weed control efficiency on spraying regimes may be because, the concentration of the extract was efficient (allelopathic potential) to inhibit weed growth and consequently lesser damages to the crop. The extracts analyzed showed high percentage of Salanin azadiractin which may be the reason for weed suppression (Table 1). It has been reported by Putman (1998) that neem seed and leaf powder inhibit the growth of striga hermathea and alfalfa (Medicago Sativa L) Xuan et al (2003) also stated that amendments of plant materials with strong allelopathic properties bring important agronomic impact including soil improvement, crop yield increment and weed reduction. The results of season, variety, weeding and spraying regimes on insect damage caused to sweet pepper during 20/16/2017 and 2018 dry season table 3 showed that more leaves were affected by insects in 2017 and lesser leaves in 2018 dry season. Significantly the leaves unaffected by insects were higher in 2018 and lower leaves were recorded in 2016 dry season. Fruits of sweet pepper were more affected in 2016 as compared to 2017 and 2018 which had statistically similar but fewer affected fruits. The results further explained that, variety weeding and spraying regimes did not have any significant effect on damage caused by insects in this study. This signifies clearly, the continuous feeding of foliage by the insect

pests and increase in their population. This also shows how ineffective the extract protects the leaves and fruit insects damage. Similar findings was made by Lowery and Isman, who opined that spray of neem leaf and neem seed didn't reduce damage caused by insects on some vegetables and grown peach under laboratory and field conditions.

Table1. Bioactive Compounds of Neem plant used during the period of the experiment.

Retention	Peak Percentage inextraction	Candidate Time	Proposed Seperation Mass	Molecular Compound	Formula	
1	11.6	1.00	597.2	SalanninA.	$C_3H_{44}O_9$	22.4
2	13.2	1.00	458.3	Gedunin	$C_{28}H_{34}O_7$	18.2
3	1.7	1.00	116.3	Hydroquinone	$C_6H_6O_2$	4.4
4	1.7	1.00	367.4	Luteolin7sulfate	$C_5H_0O_9S$	13.8
5	1.9	1.00	467.2	Nimbolide	$C_{27}H_{30}O_7$	17.5
6	13.2	1.00	483.4	Nimbinine	$C_{28}H_{34}O_7$	18.2
7	1.3	1.00	146.1	Glutamine	$C_5H_{10}N_2O_3$	5.5

Table2: Weed Components of sweet pepper as affected by variety, weeding and spray during 2016, 2017 and 2018 dry seasons at Zakirai.

Treatment	Weed Components			
	WCS	WDW	WD	WCE
Year(Y)				
2016	3.222 a	74.54ab	242.1a	55.09a
2017	2.889b	79.88a	108.0b	43.11b
2018	3.007a	71.33b	259.5a	50.68a
Probability Level	0.004	0.029	0.001	0.001
SE±	0.0704	2.28	7.12	1.402
Variety(V)				
California W	2.806	69.5	192.8	53.81
Dan Alko	3.296	81.5	215.3	44.49
Dan damasak	2.926	75.2	210.2	49.67
Yolo Wonder	3.130	69.5	194.6	50.54
Probability Level	0.148	0.559	0.862	0.094
SE±	0.1349	5.61	22.61	2.092
Weeding(W)				
Weedy check	4.500a	141.4a	212.0a	53.24c
3WAT	2.271b	45.1b	216.9a	63.77b
6WAT	2.347b	39.2b	180.7b	74.70a
Probability Level	0.001	0.001	0.001	0.001
SE±	0.0641	2.19	6.66	1.022
Spray(S)				
Control	2.981	7.74	209.2	45.32b
4WAT	2.963	76.4	204.6	50.49a
6WAT	3.120	73.7	199.0	51.27a
8WAT	3.093	73.4	200.0	51.43a
Probability Level	0.342	0.612	0.774	0.001
SE±	0.0740	2.53	7.69	1.180

Table3: Damage caused by insect on sweet pepper as affected by variety, weeding and spray during 2016, 2017 and 2018 dry seasons at Zakirai.

Treatment	Insect Damage			
	Affected leaves	Unaffected leaves	Affected fruit	Unaffected fruit
Year(Y)				
2016	11.88b	11.60c	3.010a	17.05a
2017	12.89a	19.97b	2.368b	10.90c
2018	8.89c	42.44a	2.076b	12.50b
Probability Level	0.001	0.001	0.001	0.001
SE±	0.265	0.548	0.1062	0.396
Variety(V)				
CaliforniaW	11.53	22.81	2.354	14.48
DanAlko	12.02	25.87	2.426	14.76
Dandamasak	10.24	27.09	2.889	11.86
Yolo Wonder	11.08	22.93	2.271	12.83
Probability Level	0.474	0.067	0.590	0.109
SE±	0.775	1.059	0.3329	0.777
Weeding(W)				
Weedy check	11.26	24.78	2.524	14.02
3WAT	10.99	24.62	2.391	13.58
6WAT	11.40	24.62	2.540	12.85
Probability Level	0.741	0.975	0.704	0.216
SE±	0.386	0.570	0.1383	0.476
Spray(S)				
Control	11.59	25.07	2.458	13.57
4WAT	11.18	25.01	2.428	12.37
6WAT	10.87	23.80	2.565	13.56
8WAT	11.23	24.81	2.488	14.43
Probability Level	0.725	0.487	0.939	0.074
SE±	0.446	0.658	0.1597	0.550

CONCLUSION

The results of the study revealed that weedy check plots affected weed cover score, weed density, and weed dry weight. The use of neem leaf was found to be effective on weed control efficiency only.

RECOMMENDATION

Based on the findings obtained from the experiment, it could be recommended to implement neem leaf treatments as a cost-effective strategy and to carry out another research on the efficacy of neem leaf extracts on the control of insect pests of sweet pepper.

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