EFFECT OF VETIVER GRASS ON CROP YIELD AND SOIL MOISTURE

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Abstract

Vetiver grass was planted in the dry season of 1998 in rows at various distances away from sweet corn plots, ranging from 30 to 120 cm on Yasothon soil (Oxic paleustults) which is sandy in texture, very acidic in reaction and low in plant nutrients. The objective of this experiment was to find the effect of the distance between vetiver hedgerows and sweet-corn plots on plant yield in order to set suitable spacing between these two plant species and for the purpose of erosion control and soil fertility improvement.

Results indicated clearly that the first row of sweet corn at 30, 60 and 90 cm spacing was affected by vetiver in terms of ear weight and at 30 cm spacing for stem dry weight. Spacing of 120 cm between vetiver hedgerows and sweet corn gave the highest ear weight and was not significantly different from control (no vetiver planting), followed by spacing of 90, 60, and 30 cm, respectively. The total sweet corn ear weight of the whole plot from 120-cm spacing gave higher ear weight than the control, although with no significant difference, and the lowest came from 30 cm spacing with significant difference from the others.

For soil moisture sampling and determined five times during plant growth in November-December 1998, the control plots gave the highest soil moisture content while the lowest was from 30 cm spacing. It can be postulated that in the dry season, plants were competing for moisture, but in the rainy season when soil moisture was not limited, the result could be the opposite. The experiment was repeated in the rainy season of 1999.

Introduction

On the undulating sandy soils of Northeastern Thailand, planting vetiver with the main crop may help to reduce soil erosion, improve soil fertility and preserve suitable moisture. The objective of this experiment was to find out the effect of the distance between vetiver and main crop, in this case sweet corn, on corn yield in order to set suitable spacing between these two plant species for the purpose of erosion control and soil fertility improvement.

Material and Methods

Vetiver tillers were planted in rows at various distances away from the sweet-corn plots. The distances were set at 0, 30, 60, 90 and 120 cm. The soil in the experiment was Yasothon soil (Oxic paleustults) which is loamy sand in texture, with low organic matter and plant nutrients and very acidic in reaction (Table 1). Sweet corn, KKU variety, was planted in October 1998 at 60 x 25 cm spacing. Plot length was 5 m with 20 hills in a row for 4 rows in one plot. Plot size was 5 x 2.4 m. Fertilizer was applied at the minimum rate of 50 kg/*rai* (6.25 *rai* = 1 ha) of 15-15-15 compound fertilizer. Furadan (3% g) was applied in holes at planting time and insecticide was sprayed once.

Vetiver grass (*V. zizanioides* (L.) Nash*)* was planted in rows with 10-cm spacing early in the rainy season. Compound fertilizer (15-15-15) was applied at the minimum rate of 30 kg/*rai* to improve stand. Growth and yield of sweet corn and of vetiver were determined. Soil samples were also collected and determined for moisture content during November and December 1998 at two-week

intervals. Soil analysis was done before and after the experiment. The experimental design was in RCBD with 3 replications.

Table 1. Properties of Yasothon soil (Oxic paleustults)

Texture	loamy sand (84% sand, 15% silt and 1% clay)
pH	1:1 H_2O 4.90
	1:1 KCl 4.25
OM	0.46%
Total N	0.02%
P (Bray II)	3% ppm
CEC	3.5 me/100 g soil
Ca	0.32 me/100 g soil
Mg	0.17 me/100 g soil
K	0.07 me/100 g soil
Na	0.05 me/100 g soil
ECe	0.3 mS/cm
BS.	25%
BD (0-15 cm)	1.54 g/cc (15-30 cm) 1.55 g/cc
PD (0-15 cm)	2.57 g/cc (15-30 cm) 2.60 g/cc
Total porosity	40.15%
Colour (0-15 cm)	2.5 YR 4/6 (red)
(15-30 cm)	2.5 YR 5/4 (reddish brown)
Water content at FC	9.40% (w/w)
Water content at PWP	2.36% (w/w)

Results and Discussion

Table 2 shows sweet corn ear weight for each row with different spacing. There was a significant difference only for row one. The control and 120-cm spacing gave the highest yield. The lowest yield was from 30-cm spacing. Results indicated clearly that growing vetiver with sweet corn would affect only the first row. For the first row, spacing of 120 cm gave the highest yield, even higher than control (0 cm). There was no significant difference between 90-cm and 60-cm and 60-cm and 30-cm spacing.

Table 3 shows total sweet corn ear weight for each plot with different spacing. There was a significant difference for the total ear weight of each plot (4 rows of 80 plants). The 30-cm spacing gave the lowest total ear weight significantly when compared with other spacing. There was a tendency that the closer the distance, the lower the total ear weight. The highest total ear weight came from control, followed by 120-cm spacing.

Table 2. Sweet corn ear weight for each row with different spacing (kg)

Spacing	Ear weight (kg)			
(cm)	Row 1	Row 2	Row 3	Row 4
0 (control)	2.63 a	2.75	2.79	2.38 a NS
30	0.33 c B	2.18 A	3.06 A	2.66 a A **
60	1.13 bc B	2.93 A	2.78 A	3.26 a A *
90	1.54 b B	2.82 A	3.10 A	2.73 a A *
120	3.10 a	3.03	2.53	3.11 a NS
Ave.	1.75	2.74	2.85	2.83
CV. (%)	17.3			
F-test	*	NS	NS	NS

*** = Significantly different at 1% level, * = Significantly different at 5% level, NS = Not significant*

Table 3. Total sweet corn ear weight for each plot with different spacing (kg/plot)

Spacing	Total ear weight (kg/plot)			
(cm)	Rep. I	Rep. II	Rep. III	Ave.
0 (control)	10.73	10.95	24.10	15.26 a
30	8.25	7.26	9.18	8.23 b
60	10.13	10.87	9.28	10.09 a
90	10.28	10.80	9.48	10.19 a
120	13.18	11.50	10.63	11.77 a
ave.	10.51	10.28	12.53	11.11
CV. (%)	33.3			
F-test	*			

*** = Significantly different at 1% level, * = Significantly different at 5% level, NS = Not significant*

Table 4. Sweet corn stover weight for each row with different spacing (kg)

Spacing	Stover weight (kg)			
(cm)	Row 1	Row 2	Row 3	Row 4
0 (control)	3.00 ab	3.27	3.53	3.10 NS
30	0.83 c B	2.47 A	3.60 A	2.83 A **
60	1.77 bc	3.77	3.33	3.43 NS
90	2.57 ab	3.30	3.40	2.87 NS
120	3.40 a	3.33	3.20	3.10 NS
ave.	2.31	3.23	3.41	3.07
CV. (%)	28.4			
F-test	**	NS	NS	NS

*** = Significantly different at 1% level, * = Significantly different at 5% level, NS = Not significant*

Table 4 shows stover weight of sweet corn for each row with different spacing between vetiver hedgerows and sweet corn plots. The results were similar with ear weight in Table 2. Control and 120-cm spacing gave the highest stover weight, followed by spacing of 90, 60, and 30 cm, respectively.

Table 5 shows total sweet corn stover weight for each plot (4 rows of 80 plants) with different spacing between vetiver hedgerows and sweet corn plots. There was no significant difference from the effect of spacing, but only a tendency that the closer the distance, the lower the total stover weight.

Table 5. Total sweet corn stover weight for each plot with different spacing (kg/plot)

Spacing	Total stover weight (kg/plot)			
(cm)	Rep. I	Rep. II	Rep. III	Ave.
0 (control)	13.50	12.50	12.70	12.90
30	10.20	7.90	11.10	9.73
60	12.00	13.80	11.10	12.30
90	14.10	13.60	8.70	12.13
120	13.70	13.90	11.50	13.03
ave.	12.70	12.34	11.02	12.02
CV. (%)	14.20			
F-test	NS			

*** = Significant difference at 1% level, * = Significant difference at 5% level, NS = Not significant*

Table 6 shows soil moisture content between vetiver hedgerows and sweet corn plots for five interval times during November and December 1998. The results indicated that on sandy soil under rain-fed conditions, soil moisture was low after the rainy season and dropped drastically during December. Moisture could commonly go lower than the permanent wilting point. However, water was sprayed on the surface soil on very dry days when corn plants tended to wilt. The results indicated that growing

vetiver together with sweet corn could reduce soil moisture content at all spacing distances. In the dry condition, these two plant species were competing for water. However, on the whole, the lowest soil moisture was from 30-cm spacing whereas the highest was from control.

Table 6. Soil moisture content between vetiver hedgerows and sweet corn plots for 5 interval times during 1998 (% OD)

Spacing	Moisture (% OD)					
(cm)	Nov. 5	Nov. 15	Dec. 2	Dec. 14	Dec. 27	Ave.
(control)	6.4 c	8.1 ab	8.2 b	1.9 b	1.6 b	5.2 a
30	5.1 abc	6.7 a	6.0 a	1.0 a	0.9 a	3.9 b
60	5.8 bc	8.6 b	8.0 b	1.2 a	0.7 a	4.9 a
90	3.9 ab	8.0 ab	7.1 ab	1.5 ab	0.8 a	4.3 ab
120	3.2 a	7.7 ab	7.3 ab	1.9 b	0.7 a	4.2 ab
ave.	4.9	7.8	7.3	1.5	0.9	
C.V. (%)	18					
F-test	*					

*** = Significant difference at 1% level, * = Significant difference at 5% level, NS = Not significant*

Conclusion

Growing vetiver together with sweet corn in order to reduce erosion and improve soil fertility may affect corn yield due to plant competition for water and nutrients.

In the dry season (October-December) under rain-fed conditions, vetiver grass was planted at various distances away from corn plots on loamy sand of Yasothon soil (Oxic paleustults). The distances were set at 0, 30, 60, 90 and 120 cm. Results indicated that for corn ear weight, only the first row of corn was affected. Spacing of 30 cm between vetiver hedgerows and sweet corn rows had the lowest yield significantly different from control and 120-cm spacing. The highest sweet corn ear weight came from 120-cm spacing although it was not significantly different from control. For 30-cm spacing, the lowest yield from the first row resulted in the lowest plot yield being significantly different from the others. In comparing ear weight between different rows of the same spacing, ear weight from the first row of 30, 60 and 90 cm spacing was significantly lower than that of the other rows.

Stover weight both for each row and for the whole plot followed a similar order as ear weight, but for the plot stover weight there was no significant difference between different spacing distances.

In high-elevation sandy soil, moisture could be the biggest problem to limit plant growth. In the second half of December, soil moisture dropped drastically and was often lower than PWP. Planting vetiver together with sweet corn at 30-cm spacing under rain-fed conditions in the dry season could reduce soil moisture significantly.

This experiment was repeated during the rainy season of 1999 to see the effect of the season.

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