

EFFECT OF NITROGEN, PHOSPHORUS, POTASSIUM AND CUTTING ON THE REGROWTH AND INSECT INFESTATION OF A SORGHUM AND BERSEEM CLOVER IN EGYPT

M.B. Attia

Menoufia University, Faculty of Agriculture Department of Economic Entomology and Zoology Shebin El-Kom Egypt

ABSTRACT

The objective of this study was to determine the minimum quantities of phosphorus and potassium which must be applied with varying amounts of nitrogen in order to maintain maximum hay production and minimum level of insect infestation.

This was more pronounced at the higher N rates and caused a significant N x K interaction during each of these years. There was no yield response to applied phosphorus at any N rate.

Relation between levels of nitrogen and infestation percentage was positive but infestation rate decreased with the increase of potassium levels while there was no relation between levels of phosphorus fertilization and infestation percentage.

INTRODUCTION

Berseem clover is the main annual winter forage leguminous crop in Egypt. It is rich in protein and the other total digestible nutrients, as well as caroteins and minerals.

Sorghum has reached a position of major importance as a hay and pasture.

Transforming the surplus of berseem clover and sorghum into hay is one potential way to meet the deficiency in forage for animals during the year.

Growers of berseem clover and sorghum are becoming more cognizant of the favorable response which can be obtained, both in increased forage production and protein content, by the use of relatively large amounts of nitrogen.

Because of this striking response to applied nitrogen, there is a danger of the grower minimizing the importance of the other major fertilizer elements, phosphorus and potassium.

The cotton leaf worm *spodopera littordis* Boisd. is a major pest of berseem clover and the greater sugar cane borer, *Sesamia cretica* Led. is a major pest of sorghum.

This investigation was designed and conducted from 1995 through 1996 in an effort to arrive at the minimum quantities of phosphorus and potassium which must be applied with varying amounts of nitrogen in order to maintain maximum hay production and a minimum level of insect infestation.

MATERIALS AND METHODS

Field experiments were carried out at Sharkia province during two seasons (1995 and 1996). The experiment was laid out in a randomized block design with four replications. The fertilizer treatments consisted of the following: N rates - 100, 200 and 300 Kg./feddan, P rates - 25 and 50 Kg./feddan and K rates - 25 and 50 Kg./Feddan. (Feddan = 4200 m²)

Treat.	N	P	K
1-	100	25	25
2-	100	25	50
3-	100	50	25
4-	100	50	50
5-	200	25	25
6-	200	25	50
7-	200	50	5
8-	200	50	50
9-	300	25	25
10-	300	25	50
11-	300	50	25
12-	300	50	50

Yields were taken by cutting a square meter strip through the center of each plot. The green weight of this forage was recorded and a subsample was obtained for dry matter determination.

Starting from early November until the end of May samples of 100 plants of each treatment were examined for infestation by *S.littoralis* Boisd. Starting from early May until the end of August, samples of 100 plants of each treatment were picked up randomly at weekly intervals. Stalks were examined for infestation by *S.cretica*, number of larvae, pupae and dead heart plants were counted and recorded.

RESULTS AND DISCUSSION

1. Effect of fertilizers on yield response: Results obtained for these fertilizers are summarized in Tables 1 and 2. Statistical analysis of data obtained in this respect clarified that there was no response in hay production to applications of either phosphorus or potassium during the growing season of 1995. There was a highly significant response to added potassium in 1996. This was more pronounced at the higher N rates and caused a significant N x K interaction during each of these years.

There was no yield response to applied potassium at any N rate the first year of the test. Potassium became the limiting factor in the second year on those plots receiving annual applications of 200 and 300 kg. of nitrogen per feddan.

There was no yield response to applied phosphorus at any N rate until the second year of the experiment.

2. Effect of fertilizers level on infestation rate of berseem clover by *S. littoralis* and sorghum by *S. cretica*: Results obtained for these pests are summarized in Tables (3 and 4). Statistical analysis of data obtained indicated that infestation rates of berseem clover and sorghum cultivars by *S. littoralis* and *S. cretica* was markedly affected by the level of nitrogen, potassium and phosphorus fertilization. Relation between levels of nitrogen fertilization and infestation percentages showed that infestation rate increased with the increase of nitrogen level. Relation between levels of potassium fertilization and infestation percentages showed that infestation rate decreased with an increase of potassium level. There was no relation between levels of phosphorus fertilization and infestation percentage.

Statistical analysis of data indicated that the relation between infestation rates of berseem clover and sorghum by *S. littoralis* and *S. cretica* and levels of nitrogen fertilization were highly significant at 300 kg./feddan, while insignificant at 100 kg./feddan.

The rate of berseem clover and sorghum infestation by *S. littoralis* and *S. cretica* in relation to levels of phosphorus were insignificant.

Similar findings were obtained by Ali 1979 Metwaly (1988) and Attia (1990).

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Table 1

Effect of nitrogen, potassium and phosphorus rates applied to berseem clover upon hay yield.

Treatment	N	P	K	Mean hay yield (kg.)	
				1995	1996
1	100	25	25	37.0	38.0
2	100	25	50	37.5	42.5
3	100	50	25	37.5	37.5
4	100	50	50	38.0	43.0
5	100	25	25	46.5	50.0
6	200	25	50	48.0	56.0
7	200	50	25	47.5	48.0
8	200	50	50	47.0	55.0
9	300	25	25	62.5	61.0
10	300	25	50	62.5	67.5
11	300	50	25	63.5	62.0
12	300	50	50	63.0	67.0

Table 2

Effect of nitrogen, potassium and phosphorus rates applied to Sorghum upon hay yield.

Treatment	N	P	K	Mean hay yield (kg.)	
				1995	1996
1	100	25	25	138.0	141.0
2	100	25	50	136.0	152.5
3	100	50	25	142.0	139.5
4	100	50	50	139.5	157.3
5	100	25	25	176.5	181.5
6	200	25	50	182.3	193.5
7	200	50	25	183.5	180.0
8	200	50	50	178.0	194.0
9	300	25	25	202.0	196.5
10	300	25	50	201.5	211.3
11	300	50	25	198.5	198.0
12	300	50	50	199.5	210.5

Table 3

Effect of nitrogen, potassium and phosphorus rates applied to berseem clover upon the insect infestation.

Treatment	N	P	K	Mean numbers of larvae of <i>Spodoptera littoralis</i>	
				1995	1996
1	100	25	25	400	396
2	100	25	50	416	308
3	100	50	25	408	403
4	100	50	50	422	299
5	100	25	25	632	583
6	200	25	50	654	476
7	200	50	25	646	576
8	200	50	50	552	488
9	300	25	25	783	711
10	300	25	50	793	608
11	300	50	25	788	703
12	300	50	50	762	511

Table 4

Effect of nitrogen, potassium and phosphorus rates applied to sorghum upon the insect infestation.

Treatment	N	P	K	Mean numbers of dead heart due to the infestation of <i>S. cretica</i>	
				1995	1996
1	100	25	25	28	30
2	100	25	50	31	23
3	100	50	25	29	28
4	100	50	50	29	21
5	100	25	25	42	38
6	200	25	50	39	29
7	200	50	25	41	39
8	200	50	50	42	28
9	300	25	25	53	51
10	300	25	50	56	39
11	300	50	25	54	52
12	300	50	50	56	40