

Cattle Production Loss Due to Caelifera (Orthoptera) in the State of Texas

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Abstract: The purpose of this experiment is to calculate the cattle production loss created by grasshoppers in the state of Texas. Grasshoppers create a significant deficit in cattle feed yearly which thereby leads cattle production loss for ranchers. Our (The) study involves the use of two species of grasshoppers, *Chorthippus parallelus* (Brown pg.32) and *Camnula pellucida* (Helfer pg 108), a one hundred fifty acre plot, and seventy-two head of cattle. Specimens were collected off a portion of the acreage. An average overhead was estimated for the feed deficit. Crop loss was then calculated with environmental and entomological factors taken into account. The results of this experiment showed a much larger overhead than originally predicted and the staggering effects of Caelifera on small cow and calf operations. This study could be used to further research the annual cattle production deficit on larger cattle operations such as King Ranch or stocker calf operations all over Texas, which are dependent upon rangeland for grazing cattle. The estimated results indicate that the grasshoppers are eating 14,417.5 pounds of dry matter more than the cattle are per year

Keywords: Caelifera, cattle, feed

Caelifera plague Texas crops and create feed deficits for rangeland cattle. The cattle industry is the state of Texas's number one largest revenue producing industry.(sources?) According to the research for this project, there have been no recent studies of the effects of grasshoppers on cattle production loss in the state of Texas (sources?). Before beginning the research it was known that pests result in crop loss; however, there is no exact number in current literature upon which to base beginning knowledge. The goal was to calculate the approximate dry matter deficit caused by grasshoppers and to calculate the effect that number has on cattle production in the state of Texas. This study will increase the knowledge of economic losses due to grasshoppers on cow calf operations. Additionally it will stimulate research for the creation of pesticides that will prevent the loss of such high quantities of dry matter.

Materials and Methods

Caelifera plague Texas crops and create feed deficits for rangeland cattle. The cattle industry is the state of Texas's number one largest revenue producing industry.(sources?) According to the research for this project, there have been no recent studies of the effects of grasshoppers on cattle production loss in the state of Texas (sources?). Before beginning the research it was known that pests result in crop loss; however, there is no exact number in current literature upon which to base beginning knowledge. The goal was to calculate the approximate dry matter deficit caused by grasshoppers and to calculate the effect that number has on cattle production in the state of Texas. This study will increase the knowledge of economic losses due to grasshoppers on cow calf operations. Additionally it will stimulate research for the creation of pesticides that will prevent the loss of such high quantities of dry matter.

Results

The specimens were collected off of a 150 acre pasture that holds 36 cows, 33 calves, and three bulls. *Chorthippus parallelus* (Brown pg.32) and *Camnula pellucida* (Helfer, pg.108) are the two species of grasshopper collected that inhabit the same area as the cattle. The average weight of the grasshoppers collected is 390 mg. To figure the amount of dry matter consumed by a single grasshopper per day average weight is multiplied by 16(Animal Corner, web) . The total amount is thus 6,240 mg of dry matter per day. Conversion to ounces the total equates to .2 ounces a day. To figure how much per year, .2 was multiplied by 365, resulting in 73 ounces a year. Conversion to pounds (via division by 16) results in 4.5625 pounds per year. To figure to total amount of dry matter needed per year for adequate cattle production, the total was multiplied by 26, the number of cattle. The resulting number was multiplied by their equivalency rate (Holechek, Pieper and Herbel). The total amount of dry matter was multiplied by 365 for the amount needed per year. The amount would total 206,407.5 pounds per year. To find the threshold of cattle production, 206,407.5 is divided by 4.5625, which equals 45,240 grasshoppers to cause an effect on cattle production. It was estimated that there were 400 grasshoppers per cut in the pasture. Each cut was 54,000 sq. ft and there is a total of 121 cuts possible in 150 acres. To figure the estimated total of grasshoppers on the property, 400 was multiplied by 121. This equates to 48,400 grasshoppers on the property, 7% over the threshold for cattle production. In total the grasshoppers are eating 14,417.5 pounds of dry matter more than the cattle are per year.

Yearly intake of dry matter by grasshoppers:

$$\begin{aligned} 390 \text{ mg} \times 16 &= 6,240 \text{ mg} \\ 1/28,350 \times X/6,240 &= 28,350X/28,350 = \\ &6,240/28,350 \\ 6,240/28,350 &= .2 \text{ oz} \\ .2 \times 365 &= 73 \text{ oz} \\ 73 \text{ oz} / 16 &= 4.5625 \text{ lbs per year} \end{aligned}$$

Cattle intake of dry matter a year:

$$\begin{aligned} &36 \text{ cows, 33 calves and 3 bulls} \\ 36 \times 26 &= 936 \times 365 = 341,640 \text{ lbs} \\ 33 \times 26 &= 858 \times .75 = 643.5 \times 365 = \\ &234,877.5 \text{ lbs} \\ 3 \times 26 &= 78 \times 1.5 = 117 \times 365 = 42,705 \text{ lbs} \end{aligned}$$

Average of dry matter needed per year:

$$\begin{aligned} 341,640 + 234,877.5 + 42,705 &= 619,222.5 \\ \text{lbs} \\ 619,222.5 / 3 &= 206,407.5 \text{ lbs} \end{aligned}$$

Threshold of dry matter:

$$206,407.5 / 4.5625 = 45,240 \text{ grasshoppers}$$

Calculation of total grasshoppers present:

$$\begin{aligned} \text{Cut size- } 18 \text{ ft.} \times 3000 \text{ ft.} \\ 18 \times 3000 &= 54,000 \text{ sq. ft.} \\ 6,534,000 / 54,000 &= 121 \text{ cuts} \\ 400 \times 121 &= 48,400 \text{ grasshoppers present} \end{aligned}$$

Estimated impact on cattle production:

$$\begin{aligned} 48,400 - 45,240 &= 3,160 \text{ grasshoppers} \\ 3,160 \times 4.5625 &= 14,417.5 \text{ lbs of dry matter} \end{aligned}$$

Percent over threshold:

$$3,160 / 45,240 = 0.069 = 7\% \text{ over threshold}$$

Discussion

Although it was found that the threshold of the pasture is being crossed by 7%, the calculations are far from certain. The grasshoppers occupying the same area as the cattle appear to be exploiting the resources at the expense of the cattle due to the excessive feeding of the grasshoppers. It was not possible to calculate the total pounds of forage available on the 150 acre pasture since the condition the land is in now is unknown. Without the knowledge, the amount of forage needed by the cattle

was used to calculate the amount of grasshoppers needed to cause an effect. Amount of grass is variable throughout the year and is not calculated in the results. Grasshoppers are nomadic and it is difficult to calculate the amount of damage they can cause to grasslands. Although grasshoppers do have an effect, the true amount of damage they can cause in a single year is unknown. Therefore, the effect that grasshoppers have on Texas's grasslands and cropland is subject to speculation based on estimates.

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