

Effects of Different Feeds on Digestive Tract Microorganisms and Growth and Development of East Asian Migratory Locust

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Abstract: In recent years, some achievements have been made in the research on East Asian migratory locust with different feeds, mainly focusing on the nutritional value of different feeds on the dietary application and growth and development effect of East Asian migratory locust. There are few studies on the impact of gastrointestinal microorganisms on East Asian migratory locust, and gastrointestinal microorganisms are closely related to growth and development. This paper studies the nutritional needs and physiological activities of East Asian migratory locust from the perspective of microbiology, to provide reference for the healthy growth of East Asian migratory locust.

1. Introduction

Many people know East Asian migratory locust from film and television. It is one of the culprits of China's agricultural tragedy. It can not only destroy plant growth and development, but also mainly eat gramineous plants, that is, important food crops of mankind. For thousands of years, our ancestors have known and observed East Asian migratory locusts. In the struggle against this pest, its feeding intelligence has long been observed and understood. Such as Wang Zhi's *Agricultural Alarm*, Xu guangtun's *Sacred Fragrance of Agricultural Politics*, Chen Fangsheng's *Locust Catching*, etc. all reflect the pest nature of East Asian migratory locusts.

2. Overview of East Asian Migratory Locust Digestive Tract

East Asian migratory locust (*Locusta Linnaeus*)^[1] is an important intercontinental agricultural pest. It is famous in front of people all over the world. So far, more than 10000 kinds have been found, causing varying degrees of harm in most countries, especially in developing countries such as Africa and Asia. At the same time, locust disasters are often associated with floods, drought, becoming one of the three serious natural disasters that seriously threaten agricultural production and people's life. For example, for a long time, disasters have occurred frequently in Henan, Hebei, Inner Mongolia, Shandong, Shaanxi, Anhui, Jiangsu and other regions in China. China has invested a lot of human, material and financial resources in the prevention and control of locust disasters in East Asia every year. However, due to the influence of global climate anomalies, man-made destruction and other factors, the frequency of locust disasters has increased year by year in recent ten years, such as in Baiyangdian, Cangzhou coast and Hainan.

East Asian migratory locust has always been known for its omnivorous food and a wide range of feeding plants, so it is recognized as a typical omnivorous insect. Domestic scholars can list dozens of food plants of East Asian migratory locusts, but they still don't fully understand the overall picture of the food chain of East Asian migratory locusts. In view of its complex relationship with plants, it is necessary to observe the effects of different feeds. For example, East Asian migratory locusts are particularly fond of gramineous plants. The reason is that the feeding extravagance of East Asian migratory locusts is different in pupal stage and adult stage, as well as in low density and high density. Obviously, different feed plants are related to the growth and development, adult growth and development and life span of East Asian migratory locust^[2].

3. Effects of Different Feeds on Digestive Tract Microorganisms and Growth and Development of East Asian Migratory Locust

In this paper, Mexican corn was used as the control of different feeds. By ingesting the same amount of food, the changes of microorganisms in the digestive tract and growth and development indexes of East Asian migratory locust were observed, mainly depending on the weight change and mortality. The feed was mainly several relatively cheap artificial feeds on the market. At the same time, the effects of different water content of the same feed on East Asian migratory locust were also observed.

3.1 Main Results of the Test

The main experimental feeds were Geba leaf feed, Geba leaf wheat bucket water, carrot feed, carrot wheat bucket water and winter ryegrass. Comparing this group of artificial feed with Mexican corn feed, it is found that Geba leaf feed has the best feeding effect and low cost, which is worthy of popularization. In addition, the feeding effect of carrot feed is relatively general, which can be used as auxiliary feed, while ryegrass in winter is also relatively good and the cost is low, more suitable for breeding and eating in winter. Although Mexican corn has good feeding effect, it has high cost and can be used as auxiliary feed. At the same time, it was found that East Asian migratory locusts not only like to eat Gramineae and Cyperaceae plants, but also like to eat some plants such as Compositae Geba and Umbelliferae carrots, which is more than previous studies have proved^[3]. From the analysis of water content, different water content will have different effects on the feeding effect. Relatively speaking, the feeding effect of East Asian migratory locust will be better if the feed water content is high, and the feeding behavior of East Asian migratory locust will be affected if the water content is too low. In terms of the microbial situation in the digestive tract of East Asian migratory locust, different feeds will cause changes in the microbial situation of East Asian migratory locust. For example, the isolation and purification effect of bacteria in the intestinal microbial environment of eating winter ryegrass and Mexican corn will be better. That is to say, the indicators of bacterial morphology, properties, dyeing reaction, physiological and biochemical reaction in the bacterial strains are excellent. The main bacterial strains are *Serratia*, *Brevibacterium*, *Yokenella*, *enterobacter*, *microbacteria*, etc. Different feeds will cause the same strains, and there are obvious differences in the amount of bacteria among various genera.

3.2 Analysis of Intestinal Bacteria and Bacteria in Fecal Sand of East Asian Migratory Locust

Through the isolation and purification of bacteria and the analysis of bacteria in intestinal tract and fecal sand of East Asian migratory locust fed on Mexican corn and Geba leaf, it was found that there were 11 and 12 strains in digestive tract and fecal sand respectively, 8 strains in digestive tract and fecal sand at the same time. There were 11 strains in intestinal tract and 11 strains in fecal sand, of which 9 strains appeared in intestinal tract and fecal sand at the same time. There were 6 strains of bacteria in the digestive tract fed with Mexican corn and Toad leaves, and a total of 23 different strains were obtained. According to the bacterial morphology and culture characteristics of the tested strains, the tested strains were cultured on Na medium for 24 hours. 23 strains of bacteria were identified by Gram staining and 3% KOH simple method. 6 strains were gram negative and 17 strains were gram positive. The tested strains showed different properties after cultured on Na medium at 30 °C for 48 hours. In addition, the tested strains were cultured in GXZ intelligent light incubator and YQX anaerobic incubator for 72 hours. Due to the demand for oxygen, the different strains showed facultative anaerobic, but most strains showed aerobic. All strains grow well at 18 ~ 43 °C and can still survive at 56 °C. They have universal temperature adaptability^[4], which is closely related to the wide temperature range of the growth of East Asian migratory locust. It can grow in the range of pH 4.1 ~ 9.0, and has a wide range of acid-base adaptation. It grows well at 2.5% and can grow within 10% salinity, which is related to the good adaptability of East Asian migratory locust to the environment and its survival in a large temperature range and environment. Then, the biochemical properties of 23 tested strains were determined, including the determination of contact enzymes, phenylalanine dehydrogenase and other enzymes. 6 items changed in varying

degrees [5].

4. Discussion

The comparative feed had a positive impact on the microbial environment of East Asian migratory locust, and it was also found that it had different results on its growth and development. From the analysis of the complete system, the life span, growth, molting, punishment and oviposition of East Asian migratory locust will have a certain impact. At the same time, it also proves that although East Asian migratory locust can feed on different feeds, not all feeds and plants are positive to its digestive tract microbial environment and growth and development. By studying the relationship between East Asian migratory locust and different feed materials and plants, it is helpful to analyze whether there is a large number of East Asian migratory locust in this area, because the different feed and plants represented by different feeds are very important to the existence of East Asian migratory locust. In particular, different plant species and their growth conditions will also have a positive impact on East Asian migratory locust. Therefore, from this point of view, the growth speed and reproductive ability of East Asian migratory locusts are related to different feeds, and the results will inevitably affect the number of East Asian migratory locusts. At the same time, from the different water content of the same feed, different water content will have different effects, which means that the living conditions of East Asian migratory locusts are limited in areas with insufficient water content. From the experimental results of this paper, East Asian migratory locust feeds on different seeds, and different kinds of bacteria in its digestive tract and fecal sand change in varying degrees. The analysis of bacteria in the intestinal tract and fecal sand of East Asian migratory locust fed on Mexican corn and Geba leaves showed that there were 11 and 12 strains in the intestinal tract and fecal sand respectively, and 8 strains in the intestinal tract and fecal sand at the same time. There were 11 strains in intestinal tract and 11 strains in fecal sand, of which 9 strains appeared in intestinal tract and fecal sand at the same time. There are 6 strains of bacteria feeding on Mexican corn and Toad leaves at the same time in the intestine, which may be the intestinal symbiotic bacteria of East Asian migratory locust and are not affected by food.

5. Conclusion

The study on the effects of different feed intake on the microbial bacteria and growth and development of the digestive tract of East Asian migratory locust found that different feed and water content would not only affect different bacterial strains of East Asian migratory locust, but also affect the growth and development. From this point of view, different feeds and plants are of positive significance to the digestive tract bacteria of East Asian migratory locust, which is not only conducive to improve the utilization and transformation rate of East Asian migratory locust to different feed plants, but also conducive to the effective development and utilization of East Asian migratory locust, a special resource.

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