EFFECT OF BIOLOGICAL TREATMENTS ON DATE SEED AND PERFORMANCE OF SMALL RUMINANTS

By

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B.Sc., Animal and Poultry Nutr. Dept., Fac. of Agric. Ain Shams Univ., 2005

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ABSTRACT

Shimaa Selim Salama Ibrahim: Effect of biological treatments on date seed and performance of small ruminants. Unpublished M.Sc. Thesis, Department of Animal Production, Faculty of Agriculture, Ain Shams University, 2019.

This thesis focuses of treated date seed with two cellulolytic bacteria (*Acetobacter xylinum* and *Thermonospora fusca*) isolation from rumen of sheep and evaluates differences between these species by *In-vitro* gas production and *In-vivo* trail. *In-vitro* gas production trial implemented to evaluate influence of ascending replacing date seed untreated and treated with concentrate feed mixture on some nutrient degradation and fermentation parameters .

The results pointed to that the ration content 25% untreated and treated with bacteria had significant values on NDF, ADF and hemicellulose degradability after 24 hours, especially treatment 2 (*Thermonospora fusca*) of date seed compared with the other levels untreated and treated. In the experimental ration with ascending level of untreated and treated date seed had not significant effect on pH value, while more effect on total gas production (GP),ammonia, TVFA's , MP, EMP and metabolizable energy ME (Mcal/ g). The differences were significant ($P<0.05$) between control ration and the other experimental rations. Furthermore, ration contained date seed treated (R3) had the highest values of DM, OM, CF and EE digestibility. It could be noticed that improving CP, CF and cell wall constituents (cellulose and hemicellulose, ADF, NDF) digestibility may attribute to the increasing number of rumen cellulolytic bacteria.

In conclusion, the bacterial treatment (*Acetobacter xylinum* and *Thermonospora fusca*) with date seed successfully to improve chemical composition of date seed and *In-vitro* degradability, specially ration contain 25% . It showed that the strain of *Thermonospora fusca*

contained was the best in *In-vitro* fermentation. Digestibility indicated that ration contain treated date seed (R3) was higher in DM, OM, ADF and nitrogen than other rations. It was concluded that treated date seed can replace 25% from concentrate in rations and improve *In-vitro* digestibility, degradability and no effect on rumen and blood parameters without adversely affecting on healthy of animal with takes economic factors.

Key words: Date seeds, Biological treatment, Fibrolytic bacteria, Sheep, In-vitro gas production, Digestibility, Rumen parameters, Blood parameters.

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The utilization of the food industry waste are explored by many research trends to provide an economical gain to the industry, farmers, environmental safety and sustainability. Pits of date could be used as supplementary food for poultry and animals as well as a traditional soil fertilizer. **(Guizani *et al.*, 2014)** stated that the production of date in the world was 7.5 million tons, which means that about 750 thousand tons of date seed were produced through the year of 2014. Annually, high quantities of date seeds were obtained as a waste product from date industries. Such seeds could be suitable for the production of fiber-based foods, hence, it contains dietary fiber and higher levels of the bio-active compounds **(Al–Farsi and Lee, 2014).**

So its advisable for the counties producing date through the date industry to make use of the several studies on such low cost by-product (date seeds) to achieve the higher utilization. **(Basuni and AL-Marzooq, 2010)** reported that date seeds are commonly used as cheap source of energy in animal rations under desert condition, being available in abundance all over the year. Other names of the date seeds produced as a waste from date processing are pits, stone or pips and kernels. But such undesirable material contains bio - active poly phenols, oil, protein, carbohydrate, dietary fiber, natural antioxidants, and many of the valuable substances. So it could be applied for uses as functional and medicinal supplements, cosmetics and food product formulation **(Golshan *et al.*, 2017).** The seed forms about 10 to 30% of fruit weight, large amounts of date seeds are commonly used in desert areas as a source of feed energy, it is cheap and can be offered to animals in crushed or ground form. The chemical composition of date seeds showed , the contents of DM, CP, CF, EE, NFE, ash, NDF, ADF, ADL, Hemicellulose and cellulose were around 88.2; 6.1; 7.7; 2.9; 55.2; 1.0; 50.6; 40.6; 7.0; 10.0 and 33.6%, respectively.

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The use of such seeds in feeding the small ruminants will help solving the problem of feed shortage; reduce the feed cost, as well as limiting the environmental pollution.

The problems of using these by-products in farm animals feeding, which limit their usage in animal ration formulation are:

1) Low protein % (ranged from 5.46 to 7.37)

2) high crude fiber % (ranged from 12.00 to 18.20)

3) presence of anti-nutrients compounds (i.e. Tannins and alkaloids)

4) poor quality

5) low digestibility.

El-Shaer *et al.* (2004) stated that the replacement of berseem hay by date stone with silage as a basal diet had no effect on the digestibility of NFE, EE, OM, CP and DM. However the type of the fattening diets affects the crude fiber digestion coefficient. It was noticed that the high digestion coefficients achieved in case of diet containing date stone to reach the maximum value of ADF and NDF. Best nutrition and economic potentials of the halophytic silage diet supplemented with date seed would recommend it as non-conventional fattening diet for sheep.

Al-Ani and Farhan, (2009) fed Awassi lambs diets contained 62% date stone with different sources of nitrogen (soybean meal, cotton seed meal and urea) and indicated that there was no significant difference in dry matter feed intake. (**Al-Shanti *et al.*, 2013)** concluded that substitution of corn and barely by crushed date seeds up to 50% can be used to improve the growth performance of Assaf lambs.

The researchers' attention had been directed towards the biological treatment of the crop residues that enhancing cellulosic fractions accessibility and hence their digestibility and feeding value had been improved also **(Yu *et al.*, 2009)** despite the long history of this process.

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The biological conversion of lignocelluloses requires a physical protection of cellulose by lignin against cellulolytic enzymes, which represents the major obstruction of the process. The ability of certain microbes (specifically bacteria or fungi) to disrupt cell wall of the plant by partial breakdown of the lignin-carbohydrate complex explain the potential of biological treatments **(Keller *et al.*, 2003)**. So an improvement of the biological utilization in the rumen achieved through the increase in the availability of fermentable energy to ruminal microbes **(Akin *et al.*, 1996)**.

Gado and Abd El-Galil, (2009) reported that *Acetobacter xylinum* isolated from sheep recorded the highest value of DM disappearance (61.8%) than that isolated from camels (60.2%) or buffalo (59.4%), while the lowest value was recorded for cow (58.6%). In similar trend the highest value found for *Thermonospora fusca* isolated from sheep was 61.7%, while the lowest value found in buffalo (51.3%).

The main goals of the present study are to compare effect of two types of fibrolytic bacteria isolated from rumen of sheep *(Acetobacter xylinum* and *Thermonospora fusca)* on chemical composition, cell wall constituents of treated date seeds compared with untreated. It also compares effect of replacement of concentrate feed mixture (CFM) in rations with treated and untreated date seeds on *In-vitro* gas production parameters, digestibility, rumen parameters and some blood parameters of sheep .