UTILIZATION OF SOME NON-CONVENTIONAL DIETS IN GROWING RABBITS FEEDING

By

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B.Sc. Agric. Sc. (Poultry Production), Ain Shams University, (2003)
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ABSTRACT

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This experiment was conducted to study the reduction tannins and phenolics content (anti-nutriotional factors) in Calendula Officinalis by-products (COP) using biological treatment. Clover hay was replaced by biologically treated (COP) at level 15 and 30% in growing New Zealand White rabbit diets. Effects on growth performance, nutrients digestibility, carcass traits, blood constituents, caecum traits and economic efficiency were studied. 84 unsexed weaned New Zealand White rabbits, six weeks old with an average live body weight from 850 to 900 g, were randomly assigned to 7 groups (12 rabbits each). Each group was divided into 4 replicates, (three rabbits each). The result showed that degradation of tannins and phenolics compound was more efficient when *Tricoderma reesi* were incubated with COP at 30□ C. Data showed that rabbits fed diets containing 30% COP with *T. reesie* had the best live body weight, body weight gain, feed conversion, digestion coefficient, nutrient value, and the best weight of empty carcass and dressing percentage, and high economic efficiency followed by groups fed on treated roughage with poly ethylene glycol (PEG), at 14 weeks of age, when compared with control or other groups. It can be concluded that, the feasibility of using biologically treated COP to replace clover hay; it can be used as a feed supplement in the diet of rabbits it proved to be as a good replace of clover hay without any adverse effect on rabbit performance.

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LIST OF ABBREVITIONS

CO	Calendula Officinalis
COP	Calendula Officinalis by-products
PEG	Polyethylene glycol
TR	Tricoderma ressi
DM	Dry Matter
OM	Organic Mater
CP	Crud Protein
CF	Crud Fiber
EE	Ether Extract
NFE	Nitrogen Free Extract
DE	Digestible energy
TT	Total Tannins
TP	Total Phenolics
BWD	Body Weight Gain
FC	Feed Consumption
FCR	Feed Conversion Ratio
MR	Mortality Rate
VFA	volatile fatty acid
PTP	Plasma Total Protein
AST	Aspartate aminotransferase
ALT	Alanine aminotransferase
HDL	High Density Lipoprotein cholesterol
LDL	Low Density Lipoprotein Cholesterol
VLDL	Very low density lipoprotein cholesterol
R.E.EF	Revenue economic efficiency
ADF	Acid detergent fiber
MF	Marigold flower
HU	Haugh unit

BF	Butanolic fraction
CM	Calendula meal
CT	Condensed tannins
FTS	Fungal treated straw
UTS	Urea treated straw
DMD	Dry matter digestible
CFD	Crud fiber digestiblity
TDN	Total digestible nutrient
NI	Nitrogen intake
UN	Urinary nitrogen
FN	Feces nitogen
ND	Nitrogen digestibale
NB	Nitrogen balance
N	Nitrogen
CPD	Crud protein digestibale
DCP	Digestibale crud protein
GAE/g	Gallic acid equivalent / gram of dray matter
SCP	Single cell protein
CAT	Catalase enzyme activity
SOD	Superoxide dismutase
GSH-Px	Glutathione peroxidase
GSH	Glutathione
MDA	Malondialdehyde
EM	Effective microorganism
FDA	Food and Drug Administration
RE/g	reagent equivalent/ gram
UV	Ultra viloet

INTRODUCTION

In Egypt, the shortage in feedstuffs is considered the main problem facing the development of animal production. Mean time, there are vast quantities of residues of crops, vegetables and fruits and herbs, such as potato vines, eggplant shoots, pea vines, watermelon leaves and tomato vines, artichoke by-products, calendula officinalis that are wasted and not used in animal feed.

Herbal plants by-products are the cheapest source of essential amino acids, vitamins and mineral. It is mainly used because of its various biological activities. But, the presence of inherent toxic factors or anti-nutritional components in certain plants is considered one of the major obstacles in harnessing their full benefits and nutritional value **(Lewis and Fenwik, 1987).** *Calendula officinalis* L. (English marigold, pot marigold) belongs to the Asteraceae (Compositae) family; is an annual herbaceous plant, native of Mediterranean countries **(Danielski *et al.*, 2007).** *C. officinalis* can be broadly applied as an antiseptic, anti-inflammatory and cicatrizing as well as a light antibacterial and antiviral agent **(Khalid *et al.*, 2010**). The plant has been reported to contain mainly polyphenols such as *p*-phydroxybenzoic, salicylic, vanillic, caffeic, gallic acids **(Gora *et al.*, 1979; Gong *et al.*, 2012),** acylated flavonoid-*O*-glycosides and methoxylated flavonoids, amino acids **(Abasova *et al.*, 1995),** alkaloids, carotenoids, saponins, tannins **(Duke, 1992),** high molecular weight polysaccharides **(Wagner *et al.*, 1984)** and triterpenoid monoesters **(Neukirch *et al.*, 2004)**. Alpha-cardinol (**Chalchat *et al.*, 1991),** delta-cadinol, delta-cadinine and gamma murolene **(Marczal *et al.*, 1987)** have been identified in the essential oil. Previous studies showed that different species of this plant, as well as different cultivars of the same species, were markedly different in the content of their phenolics, flavonoids and antioxidant activities as well as antioxidant

properties were in correlation with the content of total phenolics and flavonoids **(Ercetin *et al.*, 2012).**

Therefore, methods like as physical, chemical, physicochemical and biological treatments are essential for improving nutritive value of such by-products. Some disadvantages of these methods, such as nutritional loss, reduced sensory quality, and high cost of needed equipments, have limited their practical use in animal feed **(Gowda *et al.*, 2007).**

Polyethylene glycol (PEG) is a polymer that binds tannins irreversibly over a wide range of pH, and reduces the formation of protein-tannin complex **(Jones and Mangan, 1977).** However, the biological treatments were used to reduce anti-nutritional factor by using certain fungi, such as Aspergillus paraasiticus, in degrading aflatoxins, possibly through fungal peroxidases. Fermentation with yeast has also been found effective in destroying patulin and rubratoxin B **(Lopez-Garcia and Park, 1998).** Also, **Oda *et al.* (2002)** reported that filamentous fungi, which have been isolated from potato sprouts, are able to produce an enzyme which degraded ability to glycoalkaloids.

The aim of this study was:

1- To investigate the possibility of reducing phenolics and tannins anti-nutritional factors in herbal plants residues (such as calendula officinalis) by using biological and chemical treatments.

2- To investigate the possibility of replacing clover hay by biologically and chemically treated herbal plants residues (calendula officinalis) for up to 15% or 30%, and their effects on productive performance of growing rabbits.

REVIEW OF LITERATURE

2.1. Scientific Classification

Kingdom: Planate

Unranked: Angiosperms

Unranked: Eudicots

Unranked: Asterids

Order: Asterales

Family: Asteraceae

Tribe: calenduleae

Genus: Calendula

Species: Calendula.officinalis

Calendula officinalis is a short-lived aromatic herbaceous perennial, growing to 80 cm, with sparsely branched lax or erect stems. The leaves are 5–17 cm, hairy on both sides, and with margins entire or occasionally waved or weakly toothed. The inflorescences are yellow, comprising a thick capitulum or flower head 4–7 cm diameter surrounded by two rows of hairy bracts; in the wild plant they have a single ring of ray florets surrounding the central disc florets. The disc florets are tubular and hermaphrodite, and generally of a more intense orange-yellow color than the female, tridentate, peripheral ray florets. The flowers may appear all year long where conditions are suitable. *Calendula officinalis* is widely cultivated and can be grown easily in sunny locations in most kinds of soils. Although perennial, it is commonly treated as an annual, particularly in colder regions where its winter survival is poor and in hot summer locations where it also does not survive.