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BIOCHEMICAL STUDIES ON SOME DESERT PLANTS

BY

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THESIS

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APPROVAL SHEET

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ABSTRACT

Our investigation was directed to one of the sources of microbial protein, it is kind of fungi named **Truffle** which is rich in protein content and grow in the north western coast of Egyptian deserts.

Chemical composition of truffle fungus (two species) were studied. The general chemical analysis indicated some differences between the two studied species, white ***(Tirmania nivea)*** and Brown ***(Terfezia boudieri)*** truffle. The white truffle had a higher content of carbohydrates and fat (54.41% and 7.85%) than the brown truffle (49.58% and 6.52%) respectively. While the brown truffle had the higher content of protein, fiber and ash (22.37%, 7.95% and 13.58%) than the white truffle (22.34%, 7.45% and 7.95%) respectively. Potassium (K) was the highest content in both species, followed by phosphorous (P) and Sodium (Na), Magnesium (Mg), Zink (Zn), copper (Cu) and Iron (Fe) were presented in both species with fairly amounts. The salt soluble protein (Globulin) was the highest amount in both species. PAG electrophoresis of truffle protein showed similar fractions with molecular weight ranged between 34.50 to 218 KDa were detected. Special interest was foucused to the amino acid contents of the truffle protein, which analyzed using amino acid anlayzer. The brown truffle contains a higher percentage of free essential amino acids (89.37%) than the white truffle (69.31%). Cysteine was the highest amino acid in white truffle, while isoleucin was the highest one in brown truffle. Brown species has almost double content of methionin and lysine than the white truffle. Arginin was the most predominating non essential amino acid in both species followed by glutamic acid. Fatty acids determination by GLC analysis showed that the major fatty acids appeared in white and brown truffle were linoleic (44.0 and 28.2%) and Oleic (37.49 and 62.85%) as relative percentages of total fatty acids. The GLC analysis of unsaponifiable matter indicated that β-sitosterol was the major sterol in white truffle (7.70%), while the brown truffle was rich in stigmasterol (42.57%). The study include phytochemical screening which revealed the presence of numerous compounds i.e saponins, alkaloids and/or nitrogen bases, sterols and/or triterpenes and carbohydrates and/or glycosides. To evaluate the biological value of white and brown truffle an experiment was carried out on 42 rats. **The results indicated that** addition of white truffle with 10,15 and 20% to the diet decreased daily gain in body weight to 0.796, 1.256 and 1.409 g/day respectively. Also addition of brown truffle with 10,15 and 20% to the diet decreased daily gain in body weight to 0.913, 1.358 and 1.467 g/day respectively. Addition of both white and brown truffle to the diet decreased the food intake relative to control which led to slight decreased in food efficiency ratio, protein efficiency ratio and biological value compared with control. Liver weight/body weight ratio was determined in normal and examined rats. The lipid pattern (total lipids, total cholesterol and triglycerides) were determined in serum and liver of rats fed on white and brown truffle compared with casien as source of protein. The effect of truffle diets on LDL, HDL and the ratio of LDL/HDL (risk ratio) were determined. The effects of white and brown truffles on transaminase enzymes, (GOT and GPT), total protein, albumin and globulin in serum were studied. No deleterious effect on liver was detected. The urea and creatinine were also determined in serum, no toxic effect of both truffle species were detected in kidney. Blood glucose level revealed slight changes in rats fed on truffle diets. Organoleptic evaluation indicated that, the total score of white truffle (80.5%) was higher than the brown truffle (75.2%).

Key words: Truffle – Chemical Composition – Protein Fractions – Nutritive value – Biochemical Parameters.

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ABBREVIATION

T. nivea	: Tirmania nivea
T. boudieri	: Terfezia boudieri
A.O.A.C.	: Association of Official Agricultural chemists.
g.	: Gram.
PER	: Protein Efficiency Ratio.
B.V	: Biological Value.
PAGE	: Polyacrylamide Gel Electrophoresis.
HPLC	: High performance liquid chromatography.
GLC	: Gas Liquid Chromatography.
HDL	: High Density Lipoprotein.
LDL	: Low Density Lipoprotein.
SGOT	: Serum Glutamate Oxaloacetate Transaminase.
SGPT	: Serum Glutamate Pyruvate Transaminase.
ANOVA	: Analysis Of Variance
SD	: Standard Deviation.
SE	: Standard Error.
S	: Significant.
N.S	: Not Significant.
H.S	: High Significant.

INTRODUCTION

INTRODUCTION

Truffles are desert ediable hypogeous ascomycetes fungi growing wildly in desert of Arabian Peninsula, widespread around the world including various part of Middle East and North Africa. It have been known to be ediable for three thousand years, and now considered as a wild crop has a nutritive and economic value. It is generally eaten as a delicious food in parts of the Arab world, it is the delicacy of food in some parts of continental Africa and is also known in the continent of Europe.

The existence of ediable hypogeous fungi was first recorded in Kuwait in (1912), it was noted also in Syria, Northern Africa (Algeria), Tunisia, Iraq, Jordon, Palastin, North Libya and Western Coast of Egyptian desert. Various local Arabic names are attributed to truffle but commonly known as "Al-Faga", this means (bursting forth) and the name is applied because at Late stage of truffle maturity, the soil surface above the fruiting body is cracked as a result of swelling of the ascocarps.

The classic Arabic name for truffle is "Al-Kameh-or Kame". Most of truffles collected from the Arabian desert and neighbouring areas of the Arab Gulf belong to two genera, Terfezia (local name, Al Kamé- Al Souda & Al Kamé – Al Bunia "Kholasi") and Tirmania (Local name, Al Kamé – Al Baidah" "Zubaidi").

Truffles, is a collective name for the species belonging to the family [Tuberaceae], Order (Tuberales), Series (Discomycetes), and class (Ascomycetes).

Field survay including northern coast of North Sinaa was appeared that Sidi Barani and Salum have the best habit for truffle production in Egyptian desert. Truffles from underground fruiting bodies or ascocarps, because of this tuberales are also called "Hypogean Discomycetes" the underground ascocarp contain a special flavour and emit strong smell, therefor they are dug and eaten by wild animals.

Ideal soils for truffles is the one with low clay content, low bulk density, high porosity, high carbonate content and relatively high soil water content through the year.