EFFECT OF SALIN WATER IN SPROUTED SOME LEGUME SEEDS BASED ALTERNATIVE TO MEAT PRODUCTS

By

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B.Sc. Agricultural Science, Fac. Agric., Cairo University, 2012

A Thesis Submitted in Partial Fulfillment

Of

The Requirements for the Degree of

MASTER OF SCIENCE
in
Agricultural Sciences
(Advanced Agricultural Systems for Arid Lands)

Arid Land Agricultural Graduated Studies and Research Institute

Faculty of Agriculture

Ain Shams University

2018

Approval Sheet

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ABSTRACT

Mohamed Abd EL Salam Abd EL Azim: Effect of Salin Water in Sprouted some Legume Seeds Based Alternative to Meat Productions. "Unpublished M.Sc., thesis. Arid Land Agricultural Graduated Studies and Research Institute, Fac. Agric., Ain Shams University, 2018.

Lentil and chickpea seeds were used to investigate the effect of seed sprouting using tap and saline water on sprout growth proximate, analysis energy, minerals content, anti-nutritional compounds and amino acids profile of sprouted samples comparing with dry seeds. Result revealed that higher NaCl concentration > 2000 ppm reduces sprouts radical length of both lentil and chickpea. Sterilized seeds sprouting using tap water and non-sterilized seeds sprouting using saline water decreased sprout moisture content and carbohydrate which resulting in reducing faucal and total coliform counts for both lentil and chickpea. Moreover these treatments increased protein content and energy (Kcal /g) as compared with dry seeds and other treatments. Sprouting decreased anti-nutritional compounds compared with dry seeds with sharply decrement in phytic acid followed by taninins content. Mineral content in sprouts were recorded. The chickpea sprout sample using sterilized seeds with tap water for sprouting serve as good sources calcium and phosphorous . Amino acid profile of lentil and chickpea sprouts were also studied Sprouts using saline water recorded higher lysine amino acid value compared with dry seeds while non-sterilized chickpea seeds sprouts using saline water recorded the higher total sulpher amino acid (Methionen + Cystiean) value. Based on these results, sprouting process is recommended to increase nutritive value and decreased anti-nutritional compounds of lentil and chickpea seeds. Replace mint of meat by chickpea and lentil sprouts in sausages was studied chemical analysis, amino acids, fatty acids, minerals , microbiological and sensory evaluations of sprout sausages samples under study were performed . The

study results make these results make a scientific contribution to the field of food safety of significant interest for sprout sausages consumers and producers

Key Words: Salinity, Chickpea, Lentil, Amino acids, Fatty acids, Chemical composition, Sprout sausages

ACKNOWLEDGEMENT

First of all, am praising **ALLAH** beneficent, the merciful for his great generous and for guiding me to carry out this work.

It honors me to convey my deepest thanks and heartfelt gratude to **prof Dr Mamdouh Mohamed Fawzy Abdallah**, professor of vegetable, Horticulture Dept., Ain Shams University, for his supervision. Reviewing the manuscript, fruitful discussion during this work and for his valuable advices while carrying out this research work He is an excellent supervisor, gave me stimulating suggestions and he was available at all time when l need his help and advice. It a great honor to work under this supervision

l am indebted to **Dr. Nashwa Atia Ibrahim Abo EL-Azam, Lecture of Vegetable Crops,** Department of Horticulture Faculty of Agriculture Ain Shams University ,of vegetable Crops, Department of Horticulture, Faculty of Agriculture, Ain Sham s University, for supervision, help and advice throughout the present study.

My deep gratitude to **Dr. Afaf Omar Serage**, Head Research. Of human nutrition, Regional Center for Food and Feed, Agricultural Research Center, for his supervision reviewing the manuscript an for his great help and fruitful discussion during this work.

My grateful thanks to every one helped me and to my colleagues for providing all the help and assistance to complete this work. l am also thankful my family for encouragement and support this work would not have been possible during this work period.

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INTRODUCTION

There has been a significant increase in the proclamation of value added meat products in Egypt. Processed meats especially sausages are common food items for many people in Egypt, as can be seen by the many fast food chains and local sausages stands. Meat, especially red meat and charcuterie products has a relatively high content of saturated fatty acids which means that a high consumption of meat also leads to a high intake of such acids. This type of fatty acids has been shown to correlate with numerous health problems such as metabolic syndrome, cardiovascular disease and cancer **[Sinha *et al.*, 2009 and Babio *et al.*, 2012]** and also increase the environmental impact. Legumes on the other hand have a much smaller impact on the environment and reduce the risk of these health problems, and could therefore be a great alternative meat protein source chickpea (*Cicer arietirum* L.) is an important legumes crop grown and is consumed all over the world especially in the Afro-Asian countries. It is a good source of carbohydrates and protein. And its protein quality is considered to be better than other legumes chickpea has significant amounts of all the essential amino acids except sulfur-containing amino acids, which can be complemented by adding cereals to the daily diet lentil (*Lens culinaris*) are the most important legume species **(Shehata, 1992).** Lentil (*Lens culinarais* Medik), a very important legume crop, is widely cultivated and its consumption is steadily increasing. grown for their small lens-shaped edible seeds which are rich in protein (35-40%) and carbohydrates, and are a good source of calcium, phosphorus, iron and vitamins B **(Giannakoula *et al.*, 2012)** It is oldest known food crops exclusively used in human foods **(Iqbal *et al.*, 2006)** it is also high in lysine and therefore a great complement to amino acid content of cereal grains **(Farzana and Khalil, 1999).**

Sprouting and production of sprouts are an old habit that was adopted over thousands of year's age by the ancient Egyptians **(Abdallah, 2008).** Sprouting is the practice of soaking and leaving seeds until they

germinate and begin to sprout. and leaving seeds until they germinate and begin to sprout. This practice is reported to be associated with improvements in the nutritive value of seeds **(Khattak *et al*, 2007 and Kumar *et al*., 2010).** Salinity is one of the most serious a biotic stress that affects, crop production in the arid and semi – arid zone of the world. Seed germination and seedling growths are known to be more sensitive to salt stress compared with later development stages **(Ashraf 1994 and Yildirim *et al.*, 2002).** Salt stress negatively affects plant morphology and physiology through osmotic and ionic stress changes biochemical responses in plant **(Khan *et al*., 2013).** On the other hand, salt stress stimulates the activity of anti -oxidant system **(Rady, 2011).**

Legumes are one of the richest and least expensive sources of protein in the human diet in many parts of the world. Among them faba bean, chickpea and lentil have great potential due to their high and good quality- protein (22-35%), whereas legumes have better nutritional qualities **(Petrovska *et al*., 2002; Aurel *et al*., 2009 and Saastamoinen *et al*., 2013).**

The aim of the present study was to:

1- Investigate the effects of sprouting using saline water on sprout characters chemical composition and anti-nutritional compounds of lentil and chickpea.

2- Investigates the replacemint of meat by chickpea and lentil sprouts in sprout sausages with focus on protein amino acids micronutrients sensory evaluation and sprout sausages food safety.

REVIEW OF LITERATURE.

In order to have a wide view on the review of this study the collected literature will be reviewed under the following items:

1- Legume seeds and sprout production

2- Salinity effects on sprouting and sprout characterization

3- Chemical composition of seed sprouts

4- Legume based automotive to sausages products

1. Legume seeds and sprout production

Legumes are the most traditional form of protein intake in the regular diet of the individuals It's "poor man's meat " are rich sources of protein, calories, minerals and vitamins **(Despande, 1992 and Iqbal *et al*., 2006)** Different Legumes are widely cultivated worldwide especially in the Afro – Asian countries and among them, Lentil (*Lens culinaris m*) and Chickpea (*Cicerarietinum L.*) are the most important species **(Shehata, 1992; Jukantial *et al*., 2012 and Iqbal *et al*., 2006).**

Nutritionally, they are characterized by high protein content (about 20-30%), a very high proportion of carbohydrate (about 50-65%) and a very low fat content (about 1%). They are a significant source of many nutrients, including fiber, protein and fe, as well as many vitamins. Research supporting pulse consumption coupled with diets low in animal protein and high in grains and cereals has been substantial. Results from six clinical trials reported at the 2008 Pulse Crop Symposium held in Toronto showed that eating beans, peas, lentils and chickpeas can help combat chronic diseases such as heart disease, obesity and diabetes and contribute to overall good health. These clinical trials linked pulse consumption with a reduction in health problems such as obesity, diabetes and CVD **(Health Canada 2008 and Anderson *et al*., 1999 and Tosh and Yada 2010)**. lentil plants are grown for their small lens – shaped edible seeds, which are rich in protein (35-40%) and carbohydrates, and

are good sources of calcium, phosphorus , iron and vitamins B **(Giannakoula *et al* ., 2012)**. Lentils also high in lysine and therefore a great complement to the amino acid content of cereal grains **(Farzana and Khalil, 1999).**

Chickpea, seeds are usually consumed in Egypt as whole or decorticated after cooking and processing in different ways and also the flour of decorticated seeds is used as supplement in bread and biscuits **(Alajaji and El–Adawy, 2006).** Chickpea is a good source of carbohydrates and protein. Moreover protein quality is considered to be better than other legumes. It has significant amounts of all the essential amino acid except sulfur - containing amino acids **(Jukantia *et al*., 2012).** On the other hand, legumes in particular lentil and chickpea seeds have been reported to contain adequate amounts of anti-nutrients **(Alonso *et al*., 2000).** Biological utilization of existing nutrients of these legumes is limited by the presence of various anti-nutritional substances **(Liener, 1994).** The mineral content of legumes is generally high, but the bio - availabilities poor due to the presence of phytate, which is a main inhibitor of iron and zinc absorption **(Sandberg, 2002).** Phytate not only decreases the bio – availability of essential minerals, it also decreases the bio- availability of proteins by forming in soluble phytate–mineral and phytate– protein complexes **(Cheryan, 1980 and Raddy and SalunKhe, 1981).**Most of the toxic and anti- nutrient effects of these compounds could be removed by several processing methods such as soak in germination and sprouting **(Soetan, 2008 and Kalpanadevi and Mohan, 2013; Mahmoud and El –Anany 2014 and Ibrahem 2017**).

Sprouting and production of sprouts are an old habit that was adopted over thousands of year's age by the ancient Egyptians **(Abdallah, 2008).** Sprouting is the practice of soaking and leaving seeds until they germinate and begin to sprout. This practice is reported to be associated with improvements in the nutritive value of seeds **(Khattak *et al*., 2007 and Kumar *et al*., 2010).**

REVIEW OF LITERATURE

Many of investigations were determined the chemical composition of sprouted faba bean seed. They found that crude protein content was ranged from 17.80 to 27.51%, ash content was ranged from 1.83 to 3.45 %, fat content was ranged from 1.23 to 5.8 % crude fiber content was ranged from 2.30 to 6.48 % and crude carbohydrate content was ranged from 59.60 to 82.13% **(Echendu *et al*., 2009 and Luo *et al*., 2013).**

Masood *et al*., (2014) found that, the composition of sprouted chickpea seed on dry matter basis were 9%, 1.83%, 6.48%, 5.8% and 17.80% for moisture, ash, crude fiber, crude fat, crude protein respectively.

Fouad and Ali (2015) found that, the composition of sprouted lentil seed on dry matter basis were 13.42, 27.51, 1.32, 22.30, 3.10 and 46.27g/100g for moisture, crude protein, crude oil, crude fiber, ash and total carbohydrate respectively.

Sprouting causes important changes in the biochemical, nutritional and sensory characteristics of legume seeds. Extensive breakdown of seed storage compounds and synthesis of structural proteins and other cell components takes place during this process. Fats and carbohydrates that are often at surplus levels in western diets are broken down while dietary fiber, which is mostly at a sub-optimal level, increases, Vitamins and secondary compounds, many of which are considered beneficial as anti-oxidants, often are altered, dramatically during germination. Phytic acid and dietary fiber both affects the uptake of micro-nutrient in the digestive tract and these compounds are altered differently during the germination process. Other anti-nutrient factors, such as the flatulence-producing a galactosidase, trypsin and chymotrypsin inhibitors, which affect the digestion of proteins are also reduced after germination (**Vidal-Valverde *et al*., 1994 and Frias *et al*., 1995).**

Masood, *et al*., (2014) found that, the composition of sprouted chickpea seed on dry matter basis were 9%, 1.83%, 6.48%, 5.8% and 17.80% for moisture, ash, crude fiber, crude fat, crude protein

respectively. **Fernandez-Orozco *et al.*, (2009)** investigated the effect of germination to improve the antioxidant properties of chickpea. The results indicated that germination caused an increment in total phenolic content, increased peroxyl radical-trapping capacity (16-55%) and Trolox equivalent antioxidant capacity TEAC) (12-23%) and a slight inhibition of lipid peroxidation inhibition was observed. Total phenolic compounds highly contributed to total antioxidant capacity. Results indicated that with the germination, the antioxidant properties of chickpea flours are enhanced and they can be used as desired ingredients for now functional food formulations. **Lopez-Amoros *et al.*, (2006)** studied the effects of varying germination conditions for beans, lentils and peas, at semi-pilot scale, on bioactive compounds and expressed that peas and beans undergo a significant increase in antioxidant activity after germination, whereas lentils show a decrease.

2. Salinity effects on sprouting and sprout characterization :

Salinity is one of the most serious a biotic stress that affects, crop production in the arid and semi – arid zone of the world. Seed germination and seedling growth are known to be more sensitive to salt stress compared with later development stages **(Ashraf 1994 and Yildirim *et al.*, 2002).** Salt stress negatively affects plant morphology and physiology through osmotic and ionic stress changes biochemical responses in plant **(Khan *et al.*, 2013).** On the other hand, salt stress stimulates the activity of antioxidant system **(Rady, 2011).** Germination is one of the most critical periods for crops subjected to salinity. Salt stress has been shown to decrease the germination rate of some crops **(Ashraf, 1994 and Yildirim *et al.*, 2002).**

The germination phase is the most important and sensitive phases in salinity tension **(Dizaji *et al.*, 1998)**. Salinity, by reducing of water potential and special poisonous ions such as: Na^+, $Cl^-$and reducing of its necessary nutrition calcium and potassium, has negative influence on seed germination **(Chesson *et al.*, 2004)**. Salinity stress increases ions