

CONTENTS

	page
LIST OF TABLES.....	iv
1. INTRODUCTION.....	1
2. REVIEW OF LITERATURE.....	4
2.1. Pea microgreens.....	4
2.2. Pea microgreens production.....	6
2.3. Chemical composition affected by germination.....	7
2.4. Seed sprouting and sprout production.....	8
2.5. Co2 concentration.....	10
2.6. Microbial inoculation.....	11
2.7. Agriculture wastes (rice straw)	13
2.8. Sprouting for livestock fodder.....	15
2.9. The Sprouting Process.....	16
2.10. Changes in dry matter due to sprouting.....	16
2.11. Changes in carbohydrates due to sprouting.....	17
2.12. Changes in protein due to sprouting.....	18
2.13. Changes in straw medium fiber fraction due to sprouting	20
3. MATERIAL AND METHODS.....	22
3.1. Materials	22
3.1.1. Microbial inoculants	22
3.1.2. Microbial media.....	22
3.1.2.1. Nutrient broth medium (Jacobs and Gerstein, 1960).	22
3.1.2.2. King's B agar Medium (Schaad, 1980)	23
3.1.2.3. Modified Ashby's medium (Abd El-Malek and Ishac, 1968)	23
3.1.3. Rice straw.....	23
3.1.4. Seeds material.....	24
3.2. Methods.....	24
3.2.1. Experimental design and treatments.....	24
3.2.1.1. CO ₂ concentrations.....	24
3.2.1.2. Addition of microbial inoculants.....	25

II

3.2.1.3.	Seeding density experiments.....	25
3.2.1.4.	Preparation of pea microgreens.....	25
3.2.1.5.	Preparation of barley green grass.....	26
3.2.2.	Parameters measured.....	26
3.2.2.1.	Harvesting	26
3.2.2.2.	Growth parameters.....	26
3.2.3.	Chemical and biochemical parameters.....	27
3.2.3.1.	Sample preparation.....	27
3.2.3.2.	Proximate analysis.....	27
3.2.3.3.	Minerals determination.....	27
3.2.3.4.	Total chlorophyll.....	27
3.2.3.5.	Spent sprout.....	28
3.2.3.6.	Parameters measured.....	28
3.3.	Statistical analysis.....	28
4.	RESULTS AND DISCUSSION.....	29
4.1.	Part I: Production of sprouts.....	29
4.1.1	Pea microgreens (green pea shoot sprouts).....	29
4.1.1.1.	Effect of CO ₂ concentrations, microbial inoculants, and their interactions on green pea shoots length, weight, and chlorophyll.	29
4.1.1.2.	Proximate analysis and energy of pea sprout sprouts as affected by microbial inoculants, CO ₂ concentrations, and their interactions.	32
4.1.1.3.	Minerals content of pea sprout shoots as affected by CO ₂ concentrations, microbial inoculants, and their interactions.	35
4.1.2.	Barley sprouts (Green barley grass).....	37
4.1.2.1.	Effect of CO ₂ concentrations, microbial inoculants, and their interactions on green barley grass shoots length, weight, and chlorophyll.	37

III

4.1.2.2.	Proximate analysis and energy of green barley grass sprouts as affected by microbial inoculants, CO ₂ concentrations, and their interactions.....	40
4.1.2.3.	Minerals content of barley sprout shoots as affected by CO ₂ concentrations, microbial inoculants, and their interactions.	42
4.2.	Part II: Production of spent sprout.....	46
4.2.1.	Proximate analysis and energy of pea spent sprouts as affected by microbial inoculants, CO ₂ concentrations, and their interactions.	46
4.2.2.	Proximate analysis and energy of barley spent sprouts as affected by microbial inoculants, CO ₂ concentrations, and their interactions.	49
4.2.3.	Effect of CO ₂ concentrations, microbial inoculants and their interaction on pea and barley spent yield, C% and C/N ratio.....	51
	Effect of elevated CO ₂ on microbial inoculants and subsequently spent sprouts.....	53
5.	SUMMARY	57
6.	REFERENCES	61
	ARABIC SUMMARY	

LIST OF TABLES

Table	page
1. Effect of CO ₂ concentrations, microbial inoculants, and their interactions on Pea microgreens shoots characters and Chlorophyll (µg Chl. /cm) (Combined data of two experiments)	31
2. Effect of CO ₂ concentrations, microbial inoculants, and their interactions on proximate analysis (g/100g) and energy (kcal/g) of microgreens pea shoot (Combined data of two experiments)	34
3. Effect of CO ₂ concentrations, microbial inoculants, and their interactions on minerals content of microgreens pea shoots (Combined data of two experiments)	36
4. Effects of CO ₂ concentrations, Microbial inoculants and their interactions on barley grass sprouts shoot characters and Chlorophyll (µg Chl. /cm) (Combined data of two experiments)	39
5. Effect of CO ₂ concentrations, microbial inoculants and their interactions on proximate analysis (g/100g) and energy (K cal. /g) of barley grass sprouts shoot (Combined data of two experiments)	41
6. Effect of CO ₂ concentrations, Microbial inoculants and their interactions on minerals content of barley grass sprouts shoot (Combined data of two experiments)	43
7. Effect of CO ₂ concentrations, microbial inoculants and their interactions on proximate analysis (g/100g) and energy (K cal. /g) of Pea microgreens spent (Combined data of two experiments)	48
8. Effect of CO ₂ concentrations, Microbial inoculants on proximate analysis (g/100g) and energy (K cal. /g) of barley green grass spent sprouts (Combined data of two	

	experiments) 50
9.	Effect of CO ₂ concentrations and microbial inoculants on microgreens pea and barley green grass spent yield (g/m ²) (Combined data of two experiments) 52

ABSTRACT

Nahed Hassan El-Sayed Hassan Eissa. Seed Sprout Production as Affected by CO₂ and Biofertilizers. Unpublished Ph.D. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2018.

Microgreen pea (*pisum sativum* L.) as salad shoots consumption within two weeks of seedling emergency is a new ready to eat baby leaf vegetable in Egypt. Green barley grass is the young leaves of barley (*Hordeum vulgare*), can take as juice powder and tablets. The internal quality change of microgreen pea shoots and barley green grass is greatly affected by surrounding environmental conditions. Especially increased elevation of carbon dioxide concentration in the air. This work was focused on the impacts of predicted climate changes conditions on the internal quality changes of 14 days old microgreen pea shoots and green barley grass using carbon dioxide concentrations (600 ppm and 800 ppm) compared with ambient air, growing in interaction with three microbial inoculants and their combinations, in tray sprouting method in semi-automated growth chambers. Obtained results showed largest numerical yield of microgreen pea and green barley grass per unit area in 800 ppm CO₂ concentration with increasing about 20% and 37.8% respectively more than ambient air followed by 600 ppm with increasing about 9.2% and 24.2 respectively than ambient air.

Moreover, CO₂ at 800 ppm increased microgreen pea and green barley grass crude protein content 37.8% and 81.9%, lipid 46.9% and 74.3% and energy 19.5 and 35.8% respectively per unit area compared with ambient air while decreased carbohydrate content in microgreen pea by 5.3% and increased in green barley grass by 20.3%. study finding suggested that microgreen pea shoots and green barley grass growing in higher CO₂ concentration maintain optimal internal quality with pronouncing for green barley grass.

Key words: Microgreen Pea, green barley grass, rice straw, CO₂, microbial inoculants, proximate analysis.