

NITRATE ACCUMULATION IN SOME FORAGE CROPS

BY

ELSAYED GAB ALLA ELSHAFFEY

B. Sc. Agric. Sci. (Soil Science), Fac. Agric., Cairo Univ., Egypt, 2008

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APPROVAL SHEET

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APPROVAL COMMITTEE

Dr. GIHAN MOHAMED ELMOGHAZY.....
Head Research of Food Safety, RCFF, ARC, Giza

Dr. SHAWKY SHEBL SAYED AHMED HOLAH.....
Professor of Soil, Fac. Agric., Cairo University

Dr. AMAL MOSTAFA AHMED.....
Head Research of Toxicology and Pathology, RCFF, ARC, Giza

Dr. SAYED TAHA ABOU- ZEID.....
Professor of Soil, Fac. Agric., Cairo University

Date: / / 2015

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SUPERVISION COMMITTEE

Dr. SAYED TAHA ABOU-ZEID
Professor of Soil, Fac. Agric., Cairo University

Dr. AMAL LOTFI ABD EL-LATIF
Associate professor of Soil, Fac. Agric., Cairo University

Dr. AMAL MOSTAFA AHMED
Head Research of Toxicology and Pathology, RCFF, ARC, Giza

Name of Candidate: ELSayed Gab Alla Elshafey

Degree: M.Sc.

Title of Thesis: Nitrate Accumulation In Some Forage Crops

Supervisors: Dr. Sayed Taha Abou-Zeid

Dr. Amal Lotfi Abd El-Latif

Dr. Amal Mostafa Ahmed

Department: Soil Science

Approval: / / 2015

ABSTRACT

Field experiment was carried out at the Experimental Station Farm in Giza, Agricultural Research Center, Egypt, during the two successive summer seasons of 2012 and 2013 to study the effect of varying sources and rates of nitrogen fertilizers on fresh and dry forage yield of sudangrass, chemical constituents, nitrate and nitrite accumulation in plant. The experiment was carried out in a split-plot design with three replications. The main plots were assigned to nitrogen fertilizers sources (Ammonium nitrate " $\text{NH}_4 \text{NO}_3$ " 33.5 % N and ammonium sulphate " $(\text{NH}_4)_2 \text{SO}_4$ " 20.6 % N). While, the sub-plots were occupied with rates of nitrogen fertilizer (50, 75, 100 and 125 kg N/fed). The results indicated that fresh and dry forage yield, nitrogen, crude protein, phosphorus, potassium, nitrite and nitrate contents were significantly decreases in the second cutting as compared with the first cutting over both seasons. Using ammonium sulphate " $(\text{NH}_4)_2 \text{SO}_4$ " as a source of nitrogen was better than using of ammonium nitrate " $\text{NH}_4 \text{NO}_3$ " as a source of nitrogen over both cuttings and seasons. Fresh and dry forage yields of sudangrass were significantly increased as nitrogen rates were increased from 50 to 75 and 100 kg N/fed, and significantly decreased due to increasing nitrogen rate from 100 to 125 kg N/fed over both seasons. By increasing nitrogen fertilizer rates, nitrogen, crude protein, phosphorus, potassium, nitrite and nitrate contents in sudangrass plants were significantly increased in the first and the second cuttings as combined over both seasons. It can be recommended that mineral fertilizing sudangrass plants with 100 kg N/fed as ammonium sulphate in order to maximize its forage yields and reduce nitrate and nitrite accumulation in plant under the environmental conditions of Giza Governorate, Egypt.

Biological experiment was carried out to investigate the effect of different levels of nitrate in Rex male rabbit diets. Forty Rex male rabbits with average body weight 700 ± 10 g were randomly assigned to 4 groups (10 animals in each). The 1st group rabbits were fed commercial basal diet (control). The other groups (2-4) were fed control diet supplemented with 1, 2 and 3% sodium nitrate (equal to 0.73, 1.46 and 2.19% nitrate), respectively. Results of the present study showed that rabbit performance (daily body weight gain, daily feed intake and feed conversion), digestibility of nutrients and nutritive values expressed as TDN % and DCP % as well as hemoglobin concentration and erythrocyte count (RBCs) of rabbits fed diet supplemented with 3% nitrate significantly ($P < 0.05$) decreased. On the other hand, methemoglobin values and blood enzymes (aspartate aminotransferase, AST and alanine aminotransferase, ALT) activities and creatinine value increased ($P < 0.05$).

Residue of nitrate in organs increased with increasing nitrate level in diet. The total count and differential of white blood cells (% of neutrophil, lymphocyte, monocyte, eosinophil, basophiles), platelets value, mortality rate and organs weight (liver, kidneys, lungs and heart) as % of slaughtered weight did not significantly ($P > 0.05$) affected by all levels of nitrate. Histological lesions of kidneys, lungs and liver due to nitrate were found. Generally, the bad effect of nitrate on rabbits increased as a nitrate concentration increased. In conclusion, rabbits under these investigations can tolerate 0.73% nitrate (1% sodium nitrate) in feed without significant negative effect. Most results of 1.46 % nitrate (2% sodium nitrate) and all results of 2.19 % nitrate (3% sodium nitrate) had toxic effect of growth performance, digestibility of nutrients, blood parameters, histological structure of internal organs of rabbits.

Key words: Nitrogen fertilizer, Nitrate Accumulation, Sudangrass

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CONTENT

	page
INTRODUCTION	1
REVIEW OF LITERATURE	5
Sudangrass	5
1. Effect of nitrogen fertilizer rates on fresh and dry weight of sudangrass	5
2. Effect of nitrogen fertilizer rates on forage yields of sudangrass	7
3. Effect of nitrogen fertilizer rates on NPK content and quality of sudangrass	10
4. Effect of sources and rates of nitrogen fertilizer on sudangrass	12
a. Nitrogen sources	12
b. Nitrogen rates	14
c. Time of application of nitrogen	17
d. Nitrate and nitrite accumulation	19
MATERIALS AND METHODS	25
First experiment	25
1. Treatments and experimental design	25
2. Meteorological data	26
3. Soil analysis	28
4. Physical and chemical analysis of soil	28
5. Plant analysis	30
6. Statistical analysis	30
Second experiment	31
1. Chemicals	31
2. Pellet diet	31
3. Experimental design	31
4. Analysis for biological experiment	32
RESULTS AND DISCUSSION	35
First experiment	35
A. Yields	35
1. Fresh forage yield (ton/fed)	35
2. Dry forage yield (ton/fed)	40

Part Title	Page
B. Chemical constituents	44
1. Nitrogen content (%)	44
2. Phosphorus content (%)	47
3. Potassium content (%)	50
4. Crude protein content (%)	54
5. Nitrite content (ppm):.....	57
6. Nitrate content (ppm)	61
Second experiment	65
1. Biochemical analysis of the blood.....	65
2. Rabbits' weight gain, feed intake, feed conversion and survival rate.....	68
3. Digestibility and nutritive values	73
4. Internal organ weights, post mortem examination and residual nitrate determination	75
5. Histological examination	77
SUMMARY	83
REFERENCES	93
ARABIC SUMMARY	

LIST OF TABLE

No	Title	page
1.	Maximum, minimum, daily, night and midday temperature (C), relative humidity (%) and wind speed at the experimental site during growing season.	27
2.	Some physical and chemical properties of the experimental soil before cultivation the experiment.....	29
3.	Fresh forage yield (ton/fed) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	38
4.	Dry forage yield (ton/fed) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	42
5.	Nitrogen content (%) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	45
6.	Phosphorus content (%) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	48
7.	Potassium content (%) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	52
8.	Crude protein content (%) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	55
9.	Nitrite content (ppm) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	59
10.	Nitrate content (ppm) as affected by sources and rates of nitrogen fertilizer produced from first and second cuttings as combined over both seasons.	63