

# 양액재배시 염화물 종류 및 첨가 농도가 상추 질산염 함량에 미치는 영향

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## Introduction

Lettuce is representative rice wrapped vegetable in Korea. Total cultivated area of lettuce is 6,428 ha which is 9.8% of leaf crop cultivated area, 65,457 ha in 1997. Cultivated area of protected lettuce is 4,376 ha which is 31.9% of 13,739 ha, total those of area.

In these days, vegetable consumer ask various crops and high quality such as no remaining chemicals and low nitrate content vegetables, increasing with their income and concerning in health.

Nitrate content of crops is difference from kind of crops, amounts of fertilization, climate and light conditions, harvest time, how to and/or when to fertilize, how to cultivation, and how to storage.

Nitrate content can reduce by breaking supplying nitrate at before harvest and changing nitrate to chloride before 5~7days to harvest in nutrient solution. These methods are can apply only once harvest crops, but are difficult to apply to leaf lettuce.

This experiment was carried out to investigate the effects of added chlorides and their concentrations on nitrate contents in lettuce in hydroponic system.

## Materials and methods

### 1. Variety and facilities

We tested "samsunjukcukmyon" (Heungnong Seeds), planting June 2. We used National Horticulture Research Institute(NHRI) standard nutrient solution for lettuce. Chemical composition of NHRI solution is N-P-K-Ca-Mg-S = 9.2-3.6-5-3-1.5-1.5 (me/L).

This experiment carried at plastic house with 70% shading to drop leaf temperature in Chungbuk Province Agricultural Research and Extension Service. It was made bed for hydroponics with styrofoam of 100 mm thick which size is 180×60×25 cm(L×W×H).

## 2. Added chlorides and their concentrations

This experiment has 7 treatments. We used NHRI solution for lettuce as control, and added chlorides to control were KCl and CaCl<sub>2</sub> and their concentrations were 1, 2, 4me/L, respectively.

Completely randomized design with 3 replications was used.

## 3. Investigation of leaf weight and nitrate contents.

Leaf weight was investigated at 2, 3, and 5 weeks after planting (WAP), respectively. Nitrate content were checked 3rd and 9th leaf at 2 and 5 WAP. We put 1 g of sample after grounding and 19 ml D.W. into 30 ml test tube. After storage 4°C for 24 hrs, we filter sample liquid and measured nitrate content with pH/ISE meter(920A, Orion) nitrate electrode.

## Results and discussion

### 1. Leaf weight

Leaf weight was the highest in CaCl<sub>2</sub> 4me/L plot as 24.75g per plant 2 WAP(Table 1). Leaf weight a plant in added CaCl<sub>2</sub> plot 3 WAP was lower as 10.67~12.75 g than those of added KCl and control. Leaf weight 5 WAP was the highest in the added KCl 1 me/L plot as 15.26 g a plant, and the lowest added CaCl<sub>2</sub> 1me/L as of 12.03 g. There is significantly difference from harvest date among treatments, and is no difference total leaf yield as of 49.44~54.19 g a plant affected by treatments.

### 2. Nitrate content

Added chloride in nutrient solution made low nitrate content in leaf lettuce leaves. Nitrate content of 3rd and 9th leaf were the lowest in the plot of KCl and CaCl<sub>2</sub> 2 me/L treatments(Table 2). Excepting CaCl<sub>2</sub> 2 me/L treatment, nitrate content in lettuce was high concentration at early stage, but relatively reduced at late growth stage.

This experiment obtained reducing nitrate content in lettuce to supplying chlorides all stage. It was different reducing nitrate content from other methods which were supplied chloride instead of nitrate only once harvest crops for a week before harvest or were not supplied nitrate late stage.

Optimum KCl and CaCl<sub>2</sub> concentrations for reducing nitrate content were 2.5 me/L, respectively, in nutrient solutions(Fig. 1).

Table 1. Leaf weight at 2, 3 and 5 weeks after planting according to added chlorides and their concentrations of chlorides in summer hydroponics.

Added chlorides	Chloride concentrations (me/L)	Leaf weight(g/plant)			Total leaf weight (g/plant)
		Weeks after planting			
		2	3	5	
Potassium chloride	1	21.71 a <sup>1</sup>	16.50 a	15.26 a	53.47 a
	2	23.25 a	13.99 ab	14.73 ab	51.97 a
	4	21.37 a	15.84 a	12.30 bc	49.51 a
Calcium chloride	1	24.68 a	12.73 bc	12.03 c	49.44 a
	2	24.05 a	10.67 c	14.95 a	49.67 a
	4	24.75 a	12.75 bc	12.30 bc	49.80 a
Control	24.14 a	16.30 a	13.75 bc	54.19 a	

<sup>1</sup>Mean separation within columns by Duncan's multiple range test at 5% level.

Table 2. Nitrate contents of 9th leaf according to added chlorides and their concentrations in nutrient solution in lettuce hydroponics.

Added chlorides	Chloride Concentrations (me/L)	Nitrate contents(mg · kg <sup>-1</sup> FW)	
		3rd leaf	9th leaf
Potassium chloride	1	951.6 ab <sup>1</sup>	776.7 ab
	2	882.7 ab	699.3 ab
	4	1,001.3 ab	701.3 ab
Calcium chloride	1	932.0 ab	806.7 ab
	2	456.9 c	638.0 b
	4	792.4 b	732.0 ab
Control	1,056.4 a	870.0 a	

<sup>1</sup>Mean separation within columns by Duncan's multiple range test at 5% level.

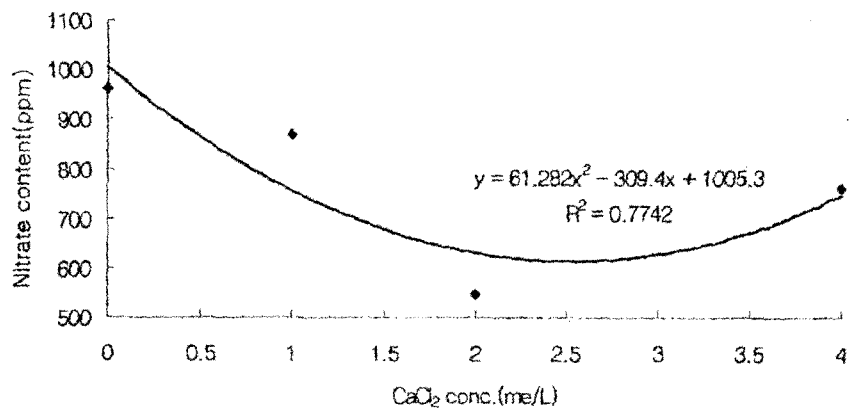
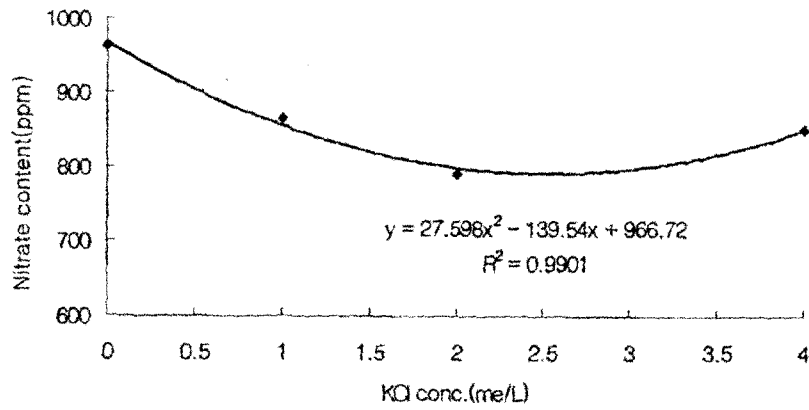


Fig. 1. Relationships between concentration of KCl and  $\text{CaCl}_2$  and nitrate content in leaf lettuce hydroponics.