Oxalate Biosynthesis of lettuce grown in salt accumulated soil

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Objectives

It has been well known that Ca fertilization has ıncreased the efflux of NO_3^+or decreased an absorption of NO_3^+ A lot of reports had ımplied that calcıum oxalate crystal may represent storage forms of calcıum and oxalic acıd, and there has been evidence of calcıum oxalate resorptıon in tımes of calcium depletion. However, there are a few reportson a change in Ca-oxalate biosynthesis under surplus N-supplement. In this study, we had tried to ılluminate the effect of lime application on and oxalate-biosynthesis under high salt stress.

Materials and Methods

- o Soil preparation : Electrical conductivity (EC) of uplandclay loamy soil with low fertılity was adjusted to (low salt) and 5 dSm^{-1}(hıgh salt) using compost and chemıcal fertilizer. The physico-chemical properties of soils were shown in table Lime was applıed in the level of 200Kg $10a^{-1}$ 30 days before transplanting
- oProlıne and betaıne analysis : Free pralıne was determined in 95% ethanol extracts from lettuce leaves. Samples of 0.5g tissues freshly harvested were crushed ın 5mL 95% (v/v) ethanol The insoluble fraction of the extract was washed twıce with 5mL of 70% ethanol. All soluble fractions were centrifuged at 3,500×g for 10 min. The supernatants were collected and stored at 4? for pralinedetermination. Betaıne was determined in 70% ethanol extracts from lettuce leaves The betaine content was accounted according to the method by Comer et al(2000). Total Kjeldahl N in a sulfuric acid digestion was determined with a Lachat Autoanalyzer(Diamond, 1992) on leaf material that had been dried at 70 ?for 48 h and ground through a 40 mesh screen. N concentrations were determined for individual leaves and expressed as Mg Kg^{-1} tissue. Other inorganic ions were analyzed usıng ICP. Sampled leaves were divided to two portions One portion was directly extracted in de-ionızed water (leaf extract), other was digested in $HClO_4$ + H_2SO_4.

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RESULTS AND DISCUSSION

To investigate the oxalate biosynthesis lettuce (*Lactuca sativa*) were grown in the soil with electrical conductivity (EC) 1 and 5 dSm-1 , respectively. Betaine biosynthesis was also enhanced with nitrogen application However, praline biosynthesis was not activated. Furthermore, it was observed that lime fertilization has exhibited an effect on the increase in chlorophyll biosynthesis, Chl a/b ratios and photosynthesis efficiency. But biomass productivity was rather reduced. It may paradoxically thickened by lime treatment. It was illuminated that pheophytin biosynthesis were not related with a lime treatment. Interestingly, soluble oxalate synthesis was extremely activated in low salt soil (EC 1dSm^{-1}) whereas insoluble oxalate was actively synthesized in high slat soil (EC 5dSm^{-1}). Ca application to lettuce rhizosphere has stimulated P and K assimilation

Table 1. The biosynthesis of praline, betaine anthocyanin, pheophytin and oxalatate induced by salt and nitrogen stress

Treatments	Proline (mg kg^{-1})	Betaine (mg kg^{-1})	Anthocyanin (g .g^{-1}fw)	Phcophytin (g.g^{-1}fw)	Oxalate(mmol L^{-1} fw)	
					Soluble	Insoluble
Soil EC						
1 dSm^{-1}	299	3.1	4 58	106.4	0.56	0.43
5 dSm^{-1}	268	45.9	5.87	135.7	0.30	1.06
N fertilization						
1/2 ST*	355	21.3	4.41	69.3	0.56	0.65
Soil testing	297	12 5	5 26	155.3	0.30	0.90
2 fold ST	227	36.0	5 22	111.1	0.53	0.67
2 fold ST+lime	256	28.3	5.98	148.6	0.45	0 77

*ST : Total fertilization of N-P_2O_5-K_2O=20.0-5.9-12.8 Kg 10a^{-1} subtracting the contents included in experimental soils.

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