

알팔파의 Autotoxicity에 대한 연구

김기준 * 정일민*

THE STUDY of ALFALFA (*Medicago sativa* L.) AUTOTOXICITY

The Research Institute of Agriculture Resources, Kon-Kuk University

Ki-June Kim * Ill-Min Chung*

Objectives:

To compare the effects of plant extracts from both field grown plant and green house grown plant, to evaluate the effects of various concentrations of water extracts on seed germination and seedling growth, and to determine whether or not the toxicity of the extract could be decreased with an adsorbent were conducted.

Materials and Methods:

Toxicity Comparison Between Field Grown and Green House Grown Plant: Mature fresh alfalfa plants, field grown and green house grown plant, were separated into leaves, stems, roots, and flowers. Concentration and Growth Study with Vegetative Stage Extracts: Concentrations of 2.5, 5.0, 7.5 and 9.0% (w/v) were prepared by soaking dried ground tissue per 100ml of distilled water at room temperature. In the pot study, 6 germinated seeds per pot with 2.5cm in length were placed in a growth pouch containing 5% (w/v) of dried tissue along with per 2000ml of Hoagrand solution I. Study of Adsorbents: By treating the alfalfa aqueous extract with activated charcoal, Amberlite and Dowex 50-W the solution extracted with 100ml distilled water with harvested plant material (1.5g) at vegetative stage. Amberlite (3g), and Dowex-50 (3g) were swollen in double distilled water overnight. All of the above mentioned experiments were repeated twice under four replication with CRD.

Results and Discussion:

The degree of inhibition was greater in the field grown plant extraction. Flowers extract of field grown plant most inhibited alfalfa germination and seedling growth. In the concentration study, the highest concentration of extract (9.0%, w/v) significantly inhibited alfalfa seed germination. In partitioning study of plant biomass into leaves, stems, root, LAR products of LWR and SLA exhibited significant variation among four species. Toxicity of extract was not reduced by adding activated charcoal, Dowex-50W, amberlite to the extract.

Table 2. Effects of the extracts of leaves, stems, roots and flowers from green house and field grown alfalfa on seedling development of alfalfa.

Treatment	RL ¹	SL ¹	TOTL ¹	RW ¹	SW ¹	LW ¹	TOTW ¹
	cm			mg			
Control (Water) Extract	5.3a	3.3a	8.6a	0.60a	0.93a	1.70a	3.23a
Leaves FGA ²	3.4d	3.1bc	6.5d	0.38cd	0.58d	1.15f	2.10f
GHA ³	3.7c	3.1bc	6.8c	0.40c	0.80b	1.50c	2.70c
Stems FGA	4.0b	3.2ab	7.2b	0.43b	0.90a	1.60b	2.98b
GHA	3.2e	3.0c	6.2e	0.38cd	0.68c	1.28e	2.33c
Roots FGA	3.7c	2.8d	6.5d	0.40c	0.60d	1.30e	2.30e
GHA	2.8f	2.8d	5.6f	0.35cd	0.75b	1.40d	2.50d
Flowers FGA	3.1c	3.0c	6.1e	0.35cd	0.55de	1.10f	2.00f
GHA	2.3g	2.7d	5.0g	0.33cd	0.50e	1.00g	1.83f
CV(%)	3.8	3.1	2.8	10.6	5.7	2.8	3.4

¹ RL, Radicle Length; SL, Shoot Length; TOTL, Total Length; RW, Root Weight; SW, Shoot Weight.

² FGA, Field Grown Alfalfa; ³ GHA, Green House Grown Alfalfa.

* Values within a column followed by the same letter are not significantly different at the 0.05 level as determined by least significant difference (LSD).

Table 4. Effects of field grown alfalfa extract on biomass partition of different cultivar at 18 days after planting.

Species	LA ¹	LWR ²	SWR ³	RWR ⁴	SLW ⁵	SLA ⁶	LAR ⁷
	cm ²	µg/mg			cm ² /mg		
Vernal	6.99a	0.59a	0.25c	0.19c	2.01a	0.50c	0.29abc
Arrow	6.34a	0.55b	0.27bc	0.17bc	1.74bc	0.58ab	0.32ab
WL-320	4.84b	0.52c	0.29ab	0.18abc	1.89ab	0.53bc	0.28bc
Dawn	5.02b	0.51c	0.30ab	0.19ab	1.56c	0.64a	0.33a
DK-125	3.84c	0.49d	0.32a	0.20a	1.84ab	0.55bc	0.27c

1; Leaf Area (LA), 2; Leaf Weight Ratio (LWR), 3; Stem Weight Ratio (SWR), 4; Root Weight Ratio (RWR), 5; Specific Leaf Weight (SLW), 6; Specific Leaf Area (SLA), 7; Leaf Area Ratio (LAR)

Table 3. Effects of various concentrations of field grown alfalfa extract at vegetative stage on germination of alfalfa.

Treatment	D1	D2	D3	D4	TOTGERM(%)
Control (Water)	44.0a	49.5a	43.8e	1.5c	98.8a
2.5	31.0b	45.0bc	14.0a	3.8ab	83.8b
5.0	15.3c	43.0a	4.8b	4.3a	67.3c
7.5	8.8d	44.8bc	15.0a	2.0bc	60.5c
9.0	7.8d	42.5c	4.8b	4.8a	49.8d
CV(%)	3.1	6.5	2.3	1.8	6.9

* Values within a column followed by the same letter are not significantly different at the 0.05 level as determined by least significant difference (LSD).