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Effects of lucerne plants on germination of lucerne

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Key words : Loess Plateau allelopathy

Introduction Auto-toxicity, an intraspecific form of allelopathy, occurs when chemical substances from plant material inhibits or delays germination and growth of the same species. Lucerne (*medicago sativa*), a perennial legume, contains water-soluble substances that are toxic (Chung and Miller, 1995). Given the likelihood of allelopathy effects when interplanting, double cropping, no-till planting and nonrotational cropping, we looked for evidence of allelopathy in lucerne as may be important when reestablishing lucerne in a former lucerne field.

Materials and methods 1-, 4-, 6- and 10-year lucerne plants grown at Qingyang experimental station Lanzhou University, were harvested at full bloom stage in June 2006. Leaves, stems, roots and flowers were separated and soaked in distilled water for 24 h at 24°C (2g of tissue per 100ml of water). In addition, a whole-plant extract was made by mixing 10ml aliquots from each plant part extracts. The plant extracts were added to 50 lucerne seeds that were surface-sterilized with 1% NaClO solution and evenly placed on filter paper in sterilized 9-petri dishes. Total of 50 alfalfa seeds were surface-sterilized with 1% NaClO solution and evenly placed on filter paper in sterilized 9-petri dishes. Germination was determined by counting at 24h intervals, the number of germinated seeds over 6-days and expressed as total percent germinated. Radicle and hypocotyl lengths were determined by measuring 10 representative seedlings on Day 7.

Results and discussion Extracts from lucerne plant parts inhibited germination but not always. Flowers were the most toxic. Stems released no toxins. Leaves and roots released toxins also but the inhibition varied with stand age; lucerne from 6-year stands had the most inhibitory effect (Table 1). The effects on seed hypocotyl and radical lengths were more pronounced and general than for seed germination. Radicle length was more affected by the extracts than was hypocotyl length. The greater effect of the toxins on extension (both of the hypocotyl and the radical) than on germination indicates the possibility for poor establishment of lucerne seedlings in lucerne fields. Auto-toxicity, if it is confirmed in the field, may require a rethink of timing of cutting. Lucerne mown before flowering hastens plant death but this may be justified in a rotation.

Table 1

Extractant	Relative germination				LSD (0.05)	hypocotyl length				LSD (0.05)	Radical length				LSD (0.05)
	Lucerne age					Lucerne age					Lucerne age				
	1-	4-	6-	10-		1-	4-	6-	10-		1-	4-	6-	10-	
Ck	100	100	100	100		1	1	1	1		1	1	1	1	
Flower	6.08	7.43	6.76	8.11	8.37	NA	NA	NA	NA		NA	NA	NA	NA	NA
Leaf	77.7	89.53	35.81	89.53	15.34	0.82	0.77	0.14	0.47	0.63	0.40	0.36	0.04	0.13	0.26
Stem	89.19	86.49	85.81	81.08	13.77	0.87	0.75	0.84	0.75	0.59	0.45	0.15	0.40	0.35	0.20
Root	65.54	87.5	51.05	90.2	11.23	0.21	0.33	0.77	0.53	0.63	0.08	0.12	0.16	0.13	0.30
Mixture	75.68	69.93	68.92	74.32	31	0.87	0.58	0.50	0.86	0.29	0.46	0.09	0.18	0.30	0.25
Control=74%	Control=3.75cm					Control=5.54cm									
LSD(0.05)	14.88	19.67	15.36	19.16		0.33	0.52	0.46	0.59		0.17	0.26	0.19	0.26	

NA : no applicable

Reference

Ill-Min Chung, Darrell A. Miller, (1995). Effect of alfalfa plant and soil extracts on growth of alfalfa. *Agron J* 87:762-767.