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Nutritional Value and Toxins in Various Noxious Weeds

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Why don't livestock eat most noxious weeds? Often weeds contain some level of toxins but most weeds are not so toxic that they cause health problems or death provided livestock have access to a variety of plant species. Novelty may be a better answer as to why livestock don't eat many weedy species. When a weed invades a pasture, it is likely a new or novel food meaning livestock grazing the pasture have never eaten the new weed. Animals learn what to eat and avoid by grazing with their mothers and through individual experience. Once animals establish a preferred diet of familiar foods, adequate in nutrients, and low in toxins, most animals simply avoid eating new foods. In no time, weeds take over because plants that are not grazed have a competitive advantage over grazed plants.

The spread of noxious weeds in pastures and on rangelands is a huge problem in the United States. Many weeds are sprayed with herbicides that provide a temporary reduction in weed populations. Teaching animals to eat noxious weeds may be a solution to reducing noxious weeds. Grazing animals often avoid eating weeds due to novelty even though weeds are often as nutritious as many of our planted pasture and rangelands species. This bulletin provides livestock producers with the nutritive values of many common weeds. These values were summarized from a variety of peer-reviewed journal articles. At the back of the bulletin is additional information on the toxicity of weeds listed in this bulletin.

Remember when using livestock to graze weeds, variety is important. Animals rarely die from over ingestion of plants with toxins provided they have a variety of forages to eat. Animals prefer to eat a variety of plants. Eating a variety of plants lessen the chances of poisoning from any single plant species. For more information see: "Why Livestock Die from Eating Poisonous Plants." extension.usu.edu/files/publications/publication/NR_Rangelands_2012-07pr.pdf

Even if an animal will readily eat a weed, it doesn't mean the animal can survive on a sole diet of that weed. Many livestock producers have met with disaster trying to force animals to survive on a diet of a single plant. Tame forage plants planted in pastures, on rangelands, or used for hay have been bred to be high in nutrients and low in toxins. These species significantly lower the risk of toxicity to grazing animals eating a single plant species.

Key for Data Tables

CP – crude protein
IVDMD – *in vitro* dry matter digestibility
TDN – total digestible nutrients
NDF – neutral detergent fiber
ADF – acid detergent fiber
TNC – total non-structural carbohydrates
Ca – calcium
P – phosphorus
DE – digestible energy

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Alyssum, Hoary	—	Early Bud	20	89	—	29								
Marten 1987	—	Mid-bloom	14	76	—	42								
	—	Full-bloom	12	64	—	52								
	—	Seed	7	58	—	60								
Blackberry, Himalaya	Spring	—	15	—	64	—								
Peters 2011	Summer	—	15	—	64	—								
	Fall	—	16	—	62	—								
Bog Rush	Spring	—	10	—	54	—								
Peters 2011	Summer	—	11	—	54	—								
	Fall	—	6	—	54	—								
Broom, French	Spring	—	20	—	62	—								
Peters 2011	Summer	—	15	—	60	—								
	Fall	—	14	—	9	—								
Broom, Portuguese	Spring	—	19	—	58	—								
Peters 2011	Summer	—	20	—	58	—								
	Fall	—	7	—	53	—								
Broom, Scotch	Spring	—	21	—	61	—								
Peters 2011	Summer	—	20	—	58	—								
	Fall	—	17	—	57	—								

Hoary Alyssum

Bog Rush

French Broom

Himalayan Blackberry

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Cheatgrass	—	Boot	15.4	—	—	—	—	4.1	10.2	2.7	40.2	27.4	0.64	0.36
Cook 1952	—	Head	11.1	—	—	—	—	4.4	10.3	2.1	41.5	30.6	0.60	0.32
	—	Dough	8.2	—	—	—	—	6.3	10.5	1.8	39.8	33.4	0.53	0.27
	Early Seed Shatter		7.4	—	—	—	—	8.4	10.7	1.6	43.6	28.3	0.51	0.26
	Late Seed Shatter		6.1	—	—	—	—	10.4	11	1.3	38.8	32.4	0.56	0.21
Cheatgrass	05/09/58	Heading	8.0	—	31.3	—	—	8.4	8.1	1.5				
Bovey 1961	05/23/58	Flowering	8.8	—	24.5	—	—	8.5	8.7	2.0				
	06/06/58	Late	7.1	—	27.2	—	—	9.7	8.7	1.8				
	06/21/58	Dough	4.6	—	35.6	—	—	11.2	9.9	1.3				
	07/03/58	Mature	4.7	—	39.6	—	—	11.4	8.0	1.2				
Dalmatian toadflax	Whole Plant	Rosette	16.5	—	—	28.6								
Frost 2011		Bolt	10.6	—	—	44.1								
		Flower	6.9	—	—	47.8								
		Seed set	5.6	—	—	51.6								
	Leaf	Rosette	16.5	—	—	28.6								
		Bolt	10.6	—	—	44.1								
		Flower	10.5	—	—	32.4								
		Seed set	8.8	—	—	51.6								
	Stem	Bolt	5.1	—	—	48.4								
		Flower	3.6	—	—	64.5								
		Seed set	3.3	—	—	64.9								

Cheatgrass

Dalmation Toadflax

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Dock, Curley	—	Vegetative	30	73	—	—	—							
Bosworth et al. 1985	—	Flower	19	54	—	—	—							
	—	Fruit	16	51	—	—	—							
Marten et al. 1987	—	Vegetative	28	77	—	24	—							
	—	Vegetative	17	64	—	33	—							
	—	Vegetative	20	50	—	33	—							
Foxtail, Green	—	none listed	14.9	—	—	—	—							
Moyer 1993	—	—	—	—	—	—	—							
Foxtail, Yellow	—	Vegetative	18	73	—	—	—							
Bosworth et al. 1980	—	Boot	12	66	—	—	—							
	—	Head	14	57	—	—	—							
Temme et al. 1979	—	Early seed	17	63	—	52	27							
	—	Seed	14	60	—	54	30							
Gorse	Spring	—	18	—	60	—	—							
Peters et al. 2011	Summer	—	17	—	58	—	—							
	Fall	—	11	—	56	—	—							
Hoary Cress	—	Rosette	28.8	77.3	—	13.1	12.0	1.9	—	1.6	2.93	9.9		
or Whitetop	—	Bolting	29.5	74.7	—	16.0	13.4	2.3	—	1.5	2.83	11.2		
McInnis 1993	—	Early bloom	20.3	69.8	—	23.9	21.6	4.4	—	1.9	2.61	17.0		
	—	Full bloom	11.3	64.9	—	34.9	28.8	5.9	—	2.2	2.44	22.0		
	—	Hard seed	7.9	49.1	—	52.8	41.8	9.4	—	2.4	1.83	32.1		

Curly Dock

Yellow Foxtail

Digestible Energy

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Hoary Cress	Whole Plant	Rosette	28.5	—	—	21.8								
or Whitetop		Bolt	28.1	—	—	24.6								
Frost 2011		Flower	19.9	—	—	35.6								
	Leaf	Rosette	28.5	—	—	21.8								
		Bolt	31.5	—	—	20.0								
		Flower	25.1	—	—	22.5								
	Stem	Bolt	37.8	—	—	18.1								
		Flower	57.1	—	—	11.3								
	Flower	Flower	26.2	—	—	20.9								

Hoary Cress or Whitetop

Jerusalem artichoke	5/18/81	Vegetative	27	86	—	22								
Marten 1987	6/1/81	Vegetative	18	81	—	34								
	6/15/81	Vegetative	11	70	—	47								
	6/29/81	Vegetative	10	66	—	49								
	5/19/82	Vegetative	29	81	—	24								
	6/1/82	Vegetative	19	81	—	29								
	7/27/82	Vegetative	22	71	—	32								

Jerusalem Artichoke

Knapweed, Diffuse		Spring	18	—	62	—
Peters 2011		Summer	12	—	62	—
		Fall	7	—	59	—

Diffuse Knapweed Flower

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Knapweed, Diffuse	30 Jan.	Rosette	16.9	—	—	—	31.8							
Miller, 1989	20 Mar.		20.4	—	—	—	—							
	15 Dec.		17.3	—	—	—	23.8							
	30 Jan.	Seedheads	7.5	—	—	—	50.8							
	20 Mar.		7.0	—	—	—	—							
	15 Dec.		8.3	—	—	—	23.8							
Knapweed, Diffuse		Rosette	18	—	—	—	—							
Roche 1999		Bolt	11	—	—	—	—							
		Bud	8	—	—	—	—							
		Flowering	8	—	—	—	—							
		Seed-ripe	7	—	—	—	—							
Kapweed, Meadow		Spring	21	63	—	—	—							
Peters 2011		Summer	17	63	—	—	—							
		Fall	8	58	—	—	—							
Knapweed, Spotted	Site 1	May	18.2	—	—	24.2	—	—	9.3	3.1	24.9			
Kelsey 1987		August	9.4	—	—	50.7	—	—	5.2	3.7	16.7			
		Aug regrow	13.4	—	—	33.3	—	—	5.7	3.4	18.7			
	Site 2	June	9.2	—	—	26.7	—	—	7.7	5.7	25.4			
		Aug	5.2	—	—	45.5	—	—	5.2	4.3	19			
		May/June	11.5	—	—	26.1	—	—	8.1	5	25.3			
		Aug	6.2	—	—	46.8	—	—	5.2	4.2	18.5			

Diffuse Knapweed

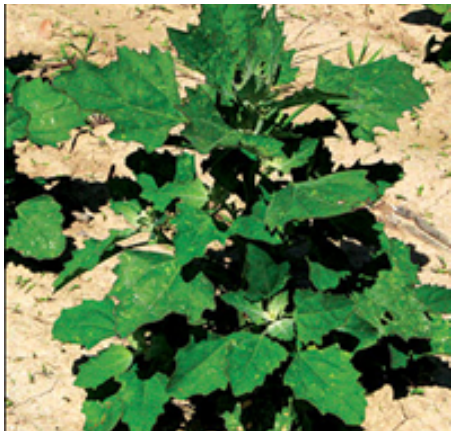
Meadow Knapweed

Spotted Knapweed

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Knapweed, Spotted		Rosette	19.5	—	24.9									
Gangulia 2010		Bolt	11.6	—	29.2									
	Flower/	Seed Set	11.3	—	40.4									
Knapweed, Spotted		Spring	20	63										
Peters 2011		Summer	13	61										
		Fall	8	59										
Lambsquarter Marten 1975		None listed	25	68	—	22								
Alfalfa for comparison[1]		None listed	27	72	—	24								
Lambsquarter		Bud	22	73	22	17								
Temme 1980		Flower	18	67	27	19								
Alfalfa for comparison[1]		Early bloom	20	70	28	23								
Lambsquarter Moyer 1993		None listed	17	70	—	—								
Leafy Spurge		Vegetative	26	80	—	18								0.53
Fox 1991		Flower	22	73	—	23								0.46
		Mature	18	66	—	28								0.39
		Regrowth	14	60	—	34								0.32

[1]Grown & collected at the same site to compare nutrition value

Spotted Knapweed



Lambsquarter

Leafy Spurge

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Medusahead	5/9/58	Leaf	10.4	—	—	26.8		6.1	13.9	2.6				
Bovey 1961	5/23/58	Head	8.8	—	—	27.4		9.7	13.7	2.3				
	6/6/58	Flower	6.8	—	—	31.2		8.6	12.8	1.8				
	6/21/58	Dough	6.5	—	—	28.1		10	14.7	1.6				
	7/3/58	Mature	7.3	—	—	30.5		7.9	14.5	1.0				
Redroot pigweed		Vegetative	24	73	—	—								
Bosworth 1980		Flower	17	71	—	—								
		Seed	11	64	—	—								
Redroot pigweed		Flower	18	74	22	16								
Marten 1975		Early seed	15	73	27	20								
Alfalfa for comparison		Early bloom	20	70	28	23								
Moyer 1993		none listed	11.5	—	—	—								
Common ragweed		None listed	25	73	—	—	25							
Marten 1975		Vegetative	26	77	—	21	17							
		Vegetative	21	70	—	26	21							
Rush Skeleton Weed	Whole Plant	Rosette	23.8	—		26.6								
Frost 2011		Bolt	14.3	—		40.9								
		Flower	7.7	—		56.8								
		Seed set	7.8	—		59.3								

[1]Grown & collected at the same site to compare nutrition value

Medusahead

Redroot Pigweed

Common Ragweed

Rush Skeleton Weed (whole plant and flower)

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Rush Skeleton Weed	Leaf	Rosette	23.8	—	—	26.6								
Frost 2011		Bolt	18.0	—	—	31.6								
		Flower	14.5	—	—	12.5								
		Seed set	12.5	—	—	41.9								
	Stem	Bolt	9.7	—	—	51.8								
		Flower	7.3	—	—	60.0								
		Seed set	6.9	—	—	61.1								
	Flower	Flower	14.4	—	—	43.9								
	Seed	Seed set	13.5	—	—	42.2								

Rush Skeleton Weed Infestation

Sedge	Spring		11	—	55		
Peters 2011	Summer		13	—	57		
	Fall		10	—	56		
Shepherd's purse		Green seed	19	55	—	37	29
Temme 1979		Seed	16	53	—	41	34
Alfalfa for comparison[1]		Early bloom	20	70	—	28	23

Sedge

Shepherd's Purse

Perennial sowthistle		Vegetative	21	79	—	27	
Marten 1987		Late Bud	16	82	—	31	
		Mid-bloom	13	66	—	45	

[1]Grown & collected at the same site to compare nutrition value

Perennial Sowthistle

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Sulfur Cinquefoil	Whole Plant	Rosette	14.6	—	—	47.6								
Frost 2011		Bolt	9.6	—	—	45.0								
		Flower	6.6	—	—	47.5								
		Seed set	4.6	—	—	52.7								
	Leaf	Rosette	14.6	—	—	47.6								
		Bolt	11.5	—	—	43.4								
		Flower	8.8	—	—	38.6								
		Seed set	5.3	—	—	41.2								
	Stem	Bolt	6.1	—	—	48.0								
		Flower	3.5	—	—	54.7								
		Seed set	2.2	—	—	62.8								
	Flower	Flower	9.1	—	—	46.9								
	Seed set	Seed	7.4	—	—	43.6								

Sulfur Cinquefoil

Tansy Ragwort	Whole Plant	Rosette	15.5	—	—	37.6								
Frost 2011		Bolt	11.5	—	—	31.7								
		Flower	8.7	—	—	49.2								
	Leaf	Rosette	15.5	—	—	37.6								
		Bolt	15.2	—	—	31								
		Flower	13.9	—	—	35.9								
	Stem	Bolt	7.4	—	—	32.8								
		Flower	3.3	—	—	58.5								
	Flower	Flower	17.6	—	—	41.1								

Tansey Ragwort

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Thistle, Bull	Spring	—	18	—	60									
Peters 2011	Summer	—	19	—	59									
	Fall	—	9	—	60									
Thistle, Canada	Spring	—	21	—	58	—								
Peters 2011	Summer	—	18	—	58	—								
	Fall	—	12	—	61	—								
Marten 1987	—	Vegetative	28	79	—	28								
	—	Vegetative	19	78	—	32								
	—	Bud	17	76		41								
	—	Bud	18	72	—	34								
	—	Mid-bloom	15	64	—	50								
Thistle, Italian	Spring	—	15	—	61									
Peters 2011	Summer	—	14	—	59									
	Fall	—	7	—	58									
Thistle, Russian Moyer 1993		None listed	10	—	—									
Thistle, Russian		50 days	14.4	68.5	—	—	20.1	4.3	24.2					
Hageman 1988		110 days	10.4	59.6	—	—	34.7	6.8	15.8					

Bull Thistle Flower

Italian Thistle Flower

Canadian Thistle Flower

Bull Thistle Plant

Russian Thistle

Common Name	Date or Season	Stage of Maturity	% CP	% IVDMD	% TDN	% NDF	% ADF	% Lignin	% Ash	% Fat	% TNC	Cellu lose	% Ca	% P
Yellow Starthistle	Spring	—	13	—	60	—								
Peters 2011	Summer	—	10	—	61	—								
	Fall	—	10	—	59	—								
Yellow Starthistle	Whole Plant	Rosette	15.7	—	—	35.8								
Frost 2011		Bolt	11.1	—	—	37.3								
		Flower	4.5	—	—	45.2								
		Seed set	3.6	—	—	55.0								
	Leaf	Rosette	15.7	—	—	35.8								
		Bolt	12.8	—	—	34.6								
		Flower	5.5	—	—	37.3								
		Seed set	6.7	—	—	43.8								
	Stem	Bolt	7.4	—	—	43.1								
		Flower	2.8	—	—	46.9								
		Seed set	2.3	—	—	61.0								
	Flower	Flower	8.2	—	—	42.5								
	Seed	Seed set	4.6	—	—	47.5								

Yellow Starthistle

Potential Toxin Problem in Weeds

Alyssum, Hoary (*Berteroa incana*) – Plant is rarely eaten. Problems only seen in horses grazing heavily infested pastures or contaminated hay. Both the green and dried plant are toxic.

Blackberry, Himalaya (*Rubus armeniacus or Rubus discolor*) – No reports of toxicity. Berries can be eaten and leaves are used to make tea.

Bog Rush (*Juncus effuses*) – No reports of toxicity. In rare cases, related species of rush cause diarrhea, nervousness, weight loss, temporary blindness, and seizures possibly due cyanide compounds in the plant.

Broom, French (*Genista monspessulana, Cytisus monspessulanus, C. racemosus, C. canariensis*) – Goats browse on several species of broom with no ill effects. In some livestock, ingestion of plant parts can cause staggering followed by paralysis. Can cause digestive disorders in horses. Symptoms probably vary with types and amount of alkaloids in the plant.

Broom, Portuguese (*Cytisus striatus*) – See description above.

Broom, Scotch (*Cytisus scoparius*) – See description above.

Cheatgrass (*Bromus tectorum*) – No reports of toxicity. Seeds and awns may cause mechanical injury.

Dalmation toadflax (*Linaria dalmatica*) – Intoxication has not been reported. Plants contain alkaloids and glycosides.

Dock, Curley (*Rumex crispus*) – Livestock poisoning from eating curly dock is rare. Cattle would need to eat considerable quantities of the plant to be affected (10-20 lbs of green plant for an adult cow). The plant accumulates oxalates, which can cause kidney disease when eaten in large quantities. May severely reduce calcium levels in blood causing depression, excess salivation, staggering, tremors, falls and labored respiration. Animals will die in a few hours after onset of symptoms unless treated with an IV calcium solution.

Foxtail, Yellow (*Setaria glauca*) – Can cause some minor problems although occurrence is rare. Common problems are cuts and ulcerations caused by sharp bristles in hay. May cause a reluctance to eat, increased salivation, and inflammation. Hay can cause degenerative arthritis in horses.

Foxtail, Green (*Setaria viridis*) – No reports of toxicity found.

Gorse (*Ulex europaeus*) – No reports of toxicity found. Goats used to control the weed.

Hoary Cress (whitetop, *Cardaria draba*) – Not listed as a toxic plant. Many members of this plant family cause digestive irritation.

Jerusalem artichoke (*Helianthus tuberosus*) – Often eaten by livestock without negative effects, but the plant may accumulate nitrate.

Knapweed, Diffuse (*Centaurea diffusa*) – Livestock will eat diffuse knapweed. No toxicity problems found.

Knapweed, Russian (*Centaurea repens*) – Toxicity is only seen in horses. Large amounts of plant must be eaten (60-100% body weight) for an extended period of time, several months or more.

Knapweed, Meadow (*Centaurea pratensis*) – No toxicity problems found.

Knapweed, Spotted (*Centaurea stoebe*; a.k.a., *C. biersteinii* and *C. maculosa*) – Livestock will eat knapweeds. No toxicity problems found.

Lambsquarter (*Chenopodium album*)–Accumulates nitrates and oxalates. Very rarely, ruminants may experience tremors, incoordination, neurologic problems, and decreased blood calcium when consumed in large quantities.

Leafy Spurge (*Euphorbia esula*) – Latex sap may be irritating to animals and humans. Young plants or gradual introduction (over several weeks) to the plant makes the plant more acceptable and is readily eaten. Sheep and goats can be used to control infestations with no ill effects. It compares nutritionally to alfalfa.

Medusahead (*Taeniatherum canput-medusae*) – No toxicity problems found.

Redroot pigweed (*Amaranthus retroflexus*) – Accumulates nitrates and oxalates. When large quantities of fresh plants are eaten in summer and fall, it can cause kidney disease. Also may cause nitrate poisoning if ruminants eat dried plants in hay.

Common ragweed (*Ambrosia artemisiifolia*) – Toxicity of ragweed not confirmed. Plant very bitter and not eaten in large quantities.

Rush Skeleton Weed (*Chondrilla juncea*) – No toxicity found. Rosettes are palatable to cattle and sheep.

Sedge – Several types are abundant in Utah. No known toxicity.

Shepherd's Purse (*Capsella bursa-pastoris*) – Not considered toxic.

Perennial sowthistle (*Sonchus arvensis*) – No reports of toxicity found. Cattle and sheep have been seen grazing the weed.

Sulfur Cinquefoil (*Potentilla recta*) – No reports of toxicity found. Avoided because of high tannin content.

Tansy Ragwort (*Senecio jacobaea*) – Cattle and horses should not be encouraged to eat tansy ragwort. Sheep are more resistant than cattle or horses. They can tolerate 10 times the level of tansy ragwort in the diet compared to cattle. Sheep have been used to control the plant.

Cattle that eat 5-10% of body weight of tansy ragwort may have acute liver damage. Eating 25-50% body weight over weeks or months causes liver fibrosis and failure. Symptoms in cattle include weight loss, weakness, mania, and rectal straining with or without prolapse. Symptoms can appear long after animal stops eating plant especially if stressed.

Horses experience an abrupt onset of symptoms such as head pressing, pacing, ataxia, chewing, yawning, drowsiness, and rectal straining with either constipation or diarrhea. Treatment is usually ineffective.

Thistle, bull (*Cirsium vulgare*) – No reports of toxicity found.

Thistle, Canada (*Cirsium arvense*) – No reports of toxicity found. May accumulate nitrate; levels of nitrate may increase several days after spraying with herbicide. Nitrate problems are found only in ruminants and are more common in cattle than sheep.

Thistle, Italian (*Carduus pycnocephalus*) – No reports of toxicity found.

Thistle, Russian (*Salsola sp.*) – Not proven to be a problem in North America. It can accumulate both nitrates and oxalates, but Hagerman (1988) reported nitrate and oxalate levels were not high enough to cause health problem in sheep or cattle.

Yellow starthistle (*Centaurea solstitialis*) – Toxicity is only seen in horses. Large amounts of plant must be consumed (near 100% of body weight) for an extended period of time apparently several months or more. Interruptions in feeding periods of 1 to 2 weeks may be protective.

*Burrows and Tyrl (2001) was the primary source for toxins in weeds.

References

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