Atlantic Poultry Research Institute
APRI FACTS

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PROBLEM WEED SEEDS IN POULTRY FEED

The contamination of grains with weed seeds is virtually guaranteed even though much effort has been expended in limiting the amount of this type of contamination. Work in screening out the smaller weed seeds has met with limited success as these seeds tend to flow with the grain. Some research indicates that this type of limited contamination is of no consequence, while more recent research done by the Atlantic Poultry Research Institute (APRI) tells a different story.

TABLE 1: Common Feedstuffs With Anti-Nutritional Properties

Feedstuffs	Toxic Compounds
Grains	
All	Phytates, Mycotoxins
Barley	Beta-glucans
Wheat	Xylans
Rye, triticale	Trypsin inhibitors, ergot, alkyl products
Milo	Tannins(Phenolics)
Buckwheat	Fagopyrin
Sorghum	Tannins
Tubers	
Potato	Solanum alkaloids
Cassava	Cyanogenic glucosides
Protein source	
Soyabean	Trypsin inhibitors, lectins, goitrogens, saponins, phytates, mycotoxins
Cottonseed	Gossypol, tannins, cycloproprenoid fatty acids, mycotoxins
Rapeseed	Glucosinolates, tannins, euricic acid, sinapine, phytic acid
Linseed	Linatine, linamarin
Fava beans	Trypsin inhibitors, vicine, lectins
Field peas	Trypsin inhibitors, lectins, tannins Oligosaccharides
Fieldbeans	Trypsin inhibitors, lectins, tannins, urease, glucosides, heamagglutinins

TABLE 2: Effect of Anti-Nutritional Compounds

Phytates:	Impair mineral absorption
Trypsin inhibitors:	Impair protein & dry matter digestion
Tannins(Phenolic):	Astringent effect in mouth reducing palatability, irritation of intestine
Fagopyrin(Phenolic):	Photosensitizing, nervous system excitement, running, squealing, prostration, low palatability
Solanum alkaloids:	Decreased growth
Cyanogenic glycosides:	Hypercalcemia, bitter taste, inhibits cytochrome oxidase a respiratory enzyme
Lectins:	Alter intestinal permeability reducing absorption, agglutination of red blood cells
Saponins	Irritation & damage to intestinal mucosa,
Gossypol:	Reduced growth & feed intake, cardiac lesions, male infertility, yolk discoloration, decreased yolk pH in storage, green eggs, pink albumen in storage, binds lysine and cysteine
Cycloproprenoid fatty acid:	Green yolk & pink albumen, carciogens, decreased yolk membrane integrity in storage, increased yolk viscosity
Glucosinolates:	Inhibit synthesis of thyroxine, anti-nutritional, inhibit thyroid function
Euricic acid:	Cardiac lesions, increased mortality, enlargement of the adrenals
Sinapine:	Fishy odor in eggs
Linatine:	Pyridoxine antagonist
Linamarin:	Hydrolyzed to potent toxin hydrogen cyanide, mortality
Vicine:	Lower chick growth, & feed efficiency, alter liver & pancreas size, reduced # of developing ova, reduced eggs numbers& weight, reduced fertility & hatchability

Over the years many seeds have been identified as having properties that are toxic to poultry or interfere with nutrient digestion and product quality. Even the more familiar feedstuffs (Table 1) have some detrimental properties.

A number of weed seeds are known to contain some of the similar anti-nutritional properties of our common feedstuffs and should be considered a risk to poultry if present in quantity.

The Atlantic Poultry Research Institute considered two such weed seeds in separate projects.

Velvetleaf Seed

Projects were initiated because of unexplained internal egg quality problems occurring in a small percentage of eggs on a number of farms. Since velvetleaf seed was found to be present in the rations on these farms a feed trial incorporating various levels of velvetleaf seed was initiated. Velvetleaf is in the same family as cotton, therefore present are two compounds- gossypol at a lower level than cottonseed and cycloproprenoid fatty acid at a similar level. Velvetleaf seed has been found in increasing numbers in our grain sources whether imported or local. Local infestation may be due to seeds imported with grains used in rations, going undigested and unknowingly being included with the organic material in cropping programs.

Research in New York state has shown that the presence of velvetleaf in diets caused interior egg quality problems. Our project confirmed these findings with a change in yolk viscosity due to increased saturated fatty acids being deposited in the yolk, causing the yolk to remain spherical when broken out. As the level of velvetleaf seed was increased in the diet the effect also tended to increase. Another effect was the deterioration of the yolk membrane during storage, leaving eggs with significantly poorer yolk quality scores after 4 days feeding the 10% velvetleaf seed ration. Effects were still being seen over a week post removal of the velvetleaf seed. Of note, eggs were effected at all levels tested, with more prominent effects as levels increased in the diet.

The on farm observation of eggs detected eggs that had the membrane collapse completely and albumin and yolk material mixing giving a greenish mixture almost of the consistency of rotten eggs, without the related smell. None of the eggs in the projects showed this extent of yolk membrane deterioration but yolk degradation was quite evident.
Feed consumption also was effected by the higher inclusion rates of velvetleaf seed and may be some of the reason for the decrease in egg production as related in Table 3 for both young and old layers.

TABLE 3: Effect of Velvetleaf on % Egg Production

Period	0%		.1%		10%	
	Young	Old	Young	Old	Young	Old
1	86	64	87	70	86	69
2	82	57	82	64	77	46
3	86	58	72	66	70	47

Period 1= Pre-velvetleaf seed feeding
2= During velvetleaf seed feeding
3= Post-velvetleaf seed feeding

Considering the anti-nutritional factors present in the velvetleaf seed the response of the layers in this project confirm their toxic effect even at low levels (Table2).

Wild Radish Seed

Another weed seed found in abundance in some regional grain crops is wild radish seed which belongs to the mustard family of which rapeseed is a member. Again the presence of a small number of eggs with poor interior quality on a farm initiated this project. Upon examination of a home grown grain source

(barley), wild radish seed was found in abundance at 2.65% of the barley. Like rapeseed this seed contains lucosinolates which effects are described in Table 2.

The project concluded by APRI illustrated (Table 4) yolk quality problems associated with glucosinolates and as the inclusion level increased so did the yolk mottling. The effects were accentuated with storage and lasted in the birds 2-3 weeks after the diet was replaced. Feed consumption was noticeably affected by inclusion of wild radish seed in the diet. Egg production, shell quality and egg weight were no different for inclusion level, but egg size in the young layers was delayed till 4 weeks after the contaminated feed was removed. Interior egg quality was effected with albumen height and Haugh Units decreasing during the contamination period and recovering only 3 weeks after removal of the contaminated feed. Storage caused significant differences in these interior egg qualities.

Table 4: Effect of Ration Contamination With Wild Radish Seed

Week	Feed Cons.(gm)			Egg Wgt(gm)			Albumen Hgt.(mm)					
	Level %			Young Layers			Old Layers			Young Layers		
	0	1.0	10.0	0	1.0	10.0	0	1.0	10.0	0	1.0	10.0
1	848.4	1018.2	894.6	53.2	54.1	52.5	5.3	5.5	5.3	9.4	8.9	9.3
2*	794.5	721.5	676.5	55.6	54.1	53.5	4.3	5.7	4.7	8.0	8.1	8.1
3*	860.7	749.3	729.0	57.7	54.7	55.0	4.7	5.3	4.6	8.6	8.3	8.1
4#	855.0	895.6	855.5	56.6	54.9	54.8	4.6	4.8	4.1	8.0	8.2	7.9
5	890.0	880.8	829.6	56.8	55.3	56.6	4.8	5.1	4.4	8.2	8.3	8.2
6	778.9	855.2	851.3	56.8	55.7	58.9	4.5	4.8	4.2	7.9	8.5	8.5
7	917.2	1061.8	921.3	64.5	66.1	65.3	4.8	4.8	4.6	8.2	8.7	8.7

* Feed contaminated with Wild radish seed
\# Feed with Wild radish seed removed

From the information available in literature and the two trials done by APRI it can be concluded that there are anti-nutritional compounds in most diets. The effect of untreated weed seeds on poultry performance would be subject to the level of contamination. There are a number of other weed seed that are regular contaminants in grains and should be considered a problem if found in abundance in a feedstuffs. Table 5 lists some of these potentially problematic weed seeds and the toxic compounds in each.

To more clearly understand the effects of each variety of weed seed research on each needs to be done, particularly with the weeds more prevalent in our region.

TABLE 5: Weed Seeds Anti-Nutritional Compounds

Weed Seed	Anti-Nutritional Compounds
Mustard	Glucosinolates, sinopine
Velvetleaf	Gossypol, cyclopropenoid fatty acids
Wild radish	Glucosinolates
Chick pea	Lathyrogens
Sweet pea	Lathyrogens
Lupin	Alkaloids
Castor bean	Lectins
Corn cockle	Saponins
Milkweed	Glucosides, Asclepdin
Vetch	Neurolathyrism
Sunflower	Phenolic-chlorogenic
St John's wort	Phenolic-hypersin
Red root pigweed	Phenolic compounds
Buckwheat	Phenolic-fagopyrin

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