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CHEMICAL & LABEL UPDATE

The following information provides registration status of particular pesticides and should not be considered as pesticide recommendations by OSU Extension.

FIELD CROPS

Bifenthrin--EPA has established a time-limited tolerance for residues of bifenthrin in or on canola seed. This action is in response to EPA's granting of an emergency exemption under section 18 authorizing use of the pesticide on canola in Idaho, Oregon, and Washington. (Federal Register, September 5, 1997)

VEGETABLES

Gamma Aminobutyric Acid-- A temporary exemption from the requirement of a tolerance for residues of the biochemical gamma aminobutyric acid has been granted, when used to increase yields of the following crops: snap beans, peanuts, cotton, potatoes, tomatoes, lettuce, green peppers, spinach, broccoli, cauliflower, and cabbage. GABA is a non-protein amino acid. Ohio is one of 21 states where this experimental program will be conducted to evaluate GABA further. (Federal Register, September 5, 1997)

Glutamic Acid--Auxein Corporation--A temporary exemption from the requirement of a tolerance for residues of the biochemical glutamic acid has been approved, when used to enhance the growth, vegetable quality, and yield of the following crops: broccoli, cabbage, cauliflower, cotton, green peppers, lettuce, peanuts, potatoes, snap beans, spinach, and tomatoes. Ohio is one of 21 states where this experimental program will be conducted. (Federal Register, September 5, 1997)

MISCELLANEOUS

Triclopyr--EPA has established a time-limited tolerance for residues of triclopyr in or on fish and shellfish. This action is in response to EPA's granting of an emergency exemption under section 18 authorizing use of the pesticide on aquatic sites for control of the Purple loosestrife in North Dakota and Minnesota. (Federal Register, September 5, 1997)

2,4-D--EPA has established a time-limited tolerance for 2,4-D in or on wild rice. This action is in response to EPA's granting of an emergency exemption under section 18 authorizing use of the pesticide on wild rice for control of common waterplantain in Minnesota. (Federal Register, September 5, 1997)

ENVIRONMENTAL ESTROGENS AND HEALTH EFFECTS

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BIOLOGICAL EFFECTS OF ESTROGENS

Estrogens are the class of hormones responsible for the development of female sexual characteristics and are involved in reproductive cycling. The physiological responses to estrogen include preparation of the uterus for implantation of a fertilized egg.

THERAPEUTIC USE OF ESTROGENS

In human females, secretion of estrogen essentially stops after menopause. Estrogen - replacement therapy is often used to ease the discomfort of menopause and reduce the risks of heart disease, osteoporosis and some gastro-intestinal cancers. Therapeutic use of estrogen increases the risks of endometrial cancer and possibly breast cancer; however, most medical authorities believe that these risks are outweighed by the benefits of estrogen therapy. Estrogens also are a component of birth control pills.

PRESENCE OF ESTROGENIC COMPOUNDS

Many estrogenic compounds are found in foods. Estrogens of animal origin usually are the same steroid hormones found in people (Jones, 1992). Most plant phenols are estrogenic and several are found in vegetables, grains, tree crops and tubers. The natural toxin Zearalenon, produced by fungal infection of grain, is one of the most potent estrogenic chemicals. Some synthetic chemicals also show estrogenic properties (Davis, 1993). Some compounds, natural and synthetic, block the action of estrogens and are considered anti-estrogens. Examples include tamoxifen -- used to treat breast cancer -- and the environmental contaminant dioxin.

THRESHOLD EFFECTS OF ESTROGENS

Hormones exert their effects by binding to biological "receptor sites" and triggering a response. For the response to occur, concentrations of hormones must reach sufficient levels, and a sufficient number of "sites" must be activated. Endocrine effects are threshold mediated; that is, below a critical concentration, there is no biological effect and a sufficient concentration must be achieved before any response occurs. Animals possess both male and female hormones; only those hormones which exceed the threshold concentrations produce biological effects (Goodman and Gilman, 1996).

ESTROGENIC POTENCY

Estrogenic compounds vary considerably in potency. For instance, if mammalian estradiol (a standard estrogen) potency is equal to 1, ethinyl-estradiol (used in birth control pills and estrogen replacement therapy) is ten times more potent and would be 10. Correspondingly, DDT is much weaker than estradiol and has a potency factor ranging from 0.0001 (Kupfer and Bulger, 1982) to 0.000001 (Safe, 1995), depending upon the laboratory model used. This means that in order to "trigger" the estrogen receptor, the body would need concentrations of DDT up to 1,000,000 times higher than estradiol. Corresponding calculations of plant estrogens (potency range from 0.01 to 0.0001), show how foods can be consumed without adverse hormone effects (Jones, 1992). Potency calculations show a daily birth control pill to have about 10 billion times more estrogenic activity than the dietary intake of organochlorine pesticides (Safe, 1995).

A recent report of a synergistic combination [i.e., effect of a combination of 2 chemicals is grater than the effects of each chemical individually] of insecticides indicated up to a 1600-fold increase in potency above single-compound administration (Arnold et al., 1996). The study utilized an *in vitro* yeast assay, endosulfan, plus 3 chlorinated hydrocarbons which are no longer registered for pesticide use. The study received wide-spread public attention with media reports that occasionally resulted in pressure on legislators. Attempts to reproduce this work, however, have not been successful in 4 US laboratories and 2 in the UK. Investigators at the National Institute of Environmental Health Sciences (NIEHS), Texas A&M, Duke, and the Chemical Industry Institute of Toxicology (Ramamoorthy, 1997) have reported the lack of such synergism. In addition, investigators at Zeneca and Brunel University (Ashby, 1997) in the UK also reported the lack of such synergism. [Note: As reported in PEP-TALK, Tulane has recently retracted its study.]

Still, interpretation of synergism in yeast, even if reproducible, would need to be tempered. The yeast cells differ from mammalian cells; many antagonists [blocks or reduces a response] in mammalian cells have substantial agonist [enhances a response] activity in yeast (Simons, 1996). Even if such synergism were to occur in mammals, the dietary concentrations of pesticides would be several orders of magnitude below the effect levels.

Studies conducted with animals using mixtures of pesticides have not shown synergism of endocrinologic effect. The NIEHS reported an investigation of the reproductive and teratogenic [i.e., mutagenic] potential of mixtures of currently registered pesticides (Heindel et al., 1994). These tests were conducted in rats and mice at exposure levels approximately 100 times higher than reasonably found in the environment and no evidence of synergism or adverse effects was observed.

While foods containing natural estrogens can generally be eaten without apparent risk, if concentrations reach sufficient levels, adverse effects can occur. Zearalenone (estrogenic NOEL [= No observable effect level] 0.05 mg/kg/day) contaminated feedstocks have produced adverse effects in swine (Dacasto, 1995). Interestingly, pesticides have been shown to reduce the amount of Zearalenone in tomatoes (El-Morshedy and Aziz, 1995). This effect sets up some intriguing questions about dietary estrogenic intake and pesticide use.

IDENTIFICATION OF ESTROGENIC ACTIVITY

Two recent legislative acts require additional testing for hormonal / estrogenic effects: the Safe Drinking Water Act and the Food Quality Protection Act. Several groups are developing proposed testing programs. These include EPA, NIEHS, CMA, as well as several independent laboratories. However, several tests among the standard toxicology studies already required for pesticide registration are capable of detecting estrogenic activity. Although reproduction studies should show the effect of hormone imbalance, multigeneration studies would be the most sensitive. Avian reproduction studies would also detect estrogenic activity. In addition, organ weights of hormone-sensitive tissue are measured in the range finding, subchronic and chronic studies. Considering that maximum tolerated doses are used in the toxicology studies, estrogenic activity relevant to human, animal or ecological effects would likely be detected in these standard tests.

Compounds which are potentially active on hormone systems have been identified by the current battery of pesticide tests. Endosulfan [=Thiodan insecticide] was identified in the reproduction and multigeneration studies as estrogenic. Vinclozolin [=Ronilan fungicide] was identified as potentially antiandrogenic (blocking of male hormones) in similar tests. In the chronic rat study, atrazine was identified as capable of disrupting the estrous [female reproductive] cycle in one strain of rat and thereby altering hormones. It is especially worthy of note that no-effect levels were identified for all these compounds. Thus, existing study guidelines determined the toxic effects as well as the potency of the products. Finally, the studies helped identify that the toxicity occurred by a threshold mechanism.

ECOLOGICAL EFFECTS OF ESTROGENS OR HORMONE DISRUPTION

Wildlife populations in some localized areas have shown toxicity which may be due to hormone effects. Although considerable testing is conducted for wildlife safety, the pesticide industry is developing additional testing for some wildlife species. One must be aware that localized effects can occur in the event of major spills and accidents.

An interesting situation has arisen in the UK relative to wildlife effects of estrogens. It has been observed that in some streams in the UK, male fish below sewage treatment outflows showed feminine characteristics. These observations were presented in the public media with accusations that synthetic chemicals were involved. The estrogenic compounds in those sewage effluents have now been identified and they are estrone, 17 B-estradiol and ethinyl-estradiol. The sources of these hormones are most likely to be anthropogenic. That is, each chemical is derived from humans. Humans combine hormones with other natural chemicals prior to excretion to make them biologically inactive. Presumably, the sewage treatment system hydrolyzes the combinations and reactivates these human hormones (Brighty, 1996).

Conclusions concerning environmental effects require that an adequate amount of data are available to support them. For instance each of the following steps must be completed and the results must be consistent:

a) Determine the type of effect.
b) Identify agents which could be responsible.
c) Establish a dose-response relationship.
d) Show that environmental concentrations match the effect.

The example from the UK described above not only identified the estrogenic substances present in the water, but also determined those concentrations were sufficient to produce the effects seen in the fish. Without complete investigation, it is not possible to determine whether wildlife effects are due to natural or synthetic chemicals.

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EPA'S REPORT OF 1994-95 ESTIMATED PESTICIDE SALES AND USE IN UNITED STATES NOW AVAILABLE

EPA is releasing its latest estimate of pesticide use in a report "Pesticide Industry Sales and Usage -- 1994 and 1995 Market Estimates." The report indicates a continuation of recent trends in pesticide use, i.e., agricultural pesticide use remaining stable with year to year variations resulting from changes in acreage planted and weather conditions.

The use of herbicides to control weeds in the United States for agricultural purposes has increased slightly over the previous three years. The increase is due primarily to more acres planted to pesticide-using crops including corn, soybeans, cotton, rice and sunflowers. At the same time, the report shows that the use of conventional pesticides for non-agricultural use (commercial, government, industry and homeowners) has declined over the same period of time.

An average of nearly $4,200 per farm was expended in 1995 on pesticides. Conventional pesticides account for about 27 percent of all pesticides used annually in the United States and total an estimated 1.2 billion pounds. Wood preservatives account for 16 percent of all pesticides used and total about .72 billion pounds; specialty biocides (such as those used to control bacterial growth in cooling towers, etc.) are about six percent of all pesticides and total .26 billion pounds; and chlorine/hypochlorites (used in water purifying plants and swimming pools) represent 51 percent of all pesticides used and total 2.32 billion pounds.

To obtain a copy of the 35-page report write or call: U.S. EPA, NCEPI, P.O. Box 42419, Cincinnati, Ohio 45242-2419; (telephone - 513-489-8190). Only single copies will be available. The report will soon be available on the Internet at www.epa.gov/pesticides. (USEPA Press Release, September 5, 1997)

USDA ANNOUNCES NEW OFFICE OF PEST MANAGEMENT AND MINOR USE TEAM

Deputy Agriculture Secretary Richard Rominger recently announced the creation of the Office of Pest Management that will serve as USDA's focal point for pesticide regulatory issues. This new office will assume the current responsibilities of the National Agricultural Pesticide Impact Assessment Program (NAPIAP). This is part of a new, coordinated approach to minor use pesticides issues that builds on existing programs at USDA and the U.S. Environmental Protection Agency (EPA).

The new office is charged with integrating and coordinating pesticide issues within USDA along with improving communications with and strengthening the existing network of grower organizations and crop specialists at land grant institutions. This will help make available accurate, high quality data on pesticide use practices for regulatory decision making.

Interregional Project No. 4 will continue to be an integral part of USDA's minor use program. IR-4, based at Rutgers University, is a publicly supported research program that collects data to support minor use registrations.

EPA's Assistant Administrator for Prevention, Pesticides, and Toxic Substances Lynn Goldman also announced the agency's newly created Minor Use Program Team. It will work closely with growers organizations, USDA, registrants and other stakeholders to obtain and use the best available data, to facilitate an open dialogue with the minor use community, and to promote the development of safer pesticides for minor uses.

EPA and USDA have been working together in recent months to secure funding for the collection of additional data on children's food consumption patterns and to collect pesticide residue information through the Pesticide Data Program. These efforts are in compliance with the Food Quality Protection Act of 1996 that requires minor use issues be handled more efficiently in a coordinated, cross-agency effort. (USDA Press Release, e-mail, September 8, 1997. John Ward, USEPA, September 11, 1997)

PSST...

"Greenpeace, the environmental advocacy organization, a few weeks ago, announced that it will reduce its U.S. staff from 400 to 65 and close regional offices in the wake of declining membership. Most of the layoffs came from the group's decision to discontinue its door-to-door canvass, which has been the mainstay of its efforts to raise money, gain new members, collect petition signatures and other activities" (P & T Chem News, August 20, 1997)

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