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My view

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Almost everyone recognizes weeds as unwelcome plants. For the homeowner, weeds affect the aesthetic quality of lawns or gardens. For agronomists, the objectionable nature of weeds arises from the reduction in food quantity (or quality) produced by crop systems. It is this latter category that has become the principal focus of most weed science research done by government, university, and private industry scientists in the United States, and deservedly so. The control of agronomic weeds is a recognized necessity in order to maintain high levels of productivity in a globalized agricultural economy.

The detrimental nature of weedy species can also refer to more than competition or aesthetics. Detrimental can also refer to effects on human health, an area of research that is usually given scant attention by weed scientists. Yet, weeds are recognized by the general public as significantly affecting human health through allergenic reactions, skin irritations, mechanical injury, or internal poisoning.

For allergy sufferers, the effect of weeds on human health is far from trivial. At present, it is estimated that approximately 10% of the U.S. population—or 30 million people—suffer from hay fever or allergic rhinitis. Symptoms include sneezing, inflammation of nose and eye membranes, and wheezing. Complications such as nasal polyps or secondary infections of the ears, nose, and throat may also be common. Severe complications, such as asthma, permanent bronchial obstructions, and damage to the lungs and heart, can occur in extreme cases. Last year, the Center for Disease Control in Atlanta, GA, reported over 5,000 deaths in the United States from allergy-induced asthma. Although there are over four dozen weedy species that produce allergenic reactions, common ragweed (*Ambrosia artemisiifolia* L.), a ubiquitous weed occurring in city lots and farmers' fields, causes more problems than all other allergenic plants combined.

One of the most common weed-induced health effects experienced by people is dermatitis. Over 100 plant species are associated with contact dermatitis. Chemical irritants can be present on all plant parts, including leaves, flowers, and roots. Such irritants can appear on the plant surface or when injury to the plant part occurs. The level of toxicity varies with a range of factors, including plant maturity, weather, soil, and plant ecotype. Most reactions caused by irritants, unlike allergic reactions, occur within a few minutes of exposure. The nature of the dermatitis induced by weeds varies depending on species. For example, the milky sap in spurges can be chemically irritating, whereas some species, such as nettles, particularly the stinging nettle (*Utica dioica* L.), are both mechanically and chemically irritating. Perhaps the best known weedy species that induces contact dermatitis is the poison ivy group (*Toxicodendron/Rhus* spp). Sensitivity to urushiol, the oil found in these species, occurs in about two of every three people, and amounts as small as 1 ng are sufficient to induce a rash. Specimens of urushiol that are several centuries old are still sufficiently potent to induce dermatitis in sensitive people. Over two million people in the United States suffer annually from contact with members of the poison ivy group: poison ivy [*T. toxicodendron* (L.) Ktze.], poison oak [*T. toxicarium* (Salisb.) Gillis], or poison sumac [*T. vernix* (L.) Ktze.].

Many weeds also induce mechanical injury. Spines, or other sharp appendages, on leaves, stems, or fruits can puncture the skin. For the unwary, removing a Canada thistle [*Cirsium arvense* (L.) Scop.] plant by hand can be a particularly painful experience. It is not uncommon for barefooted children to step on a sandbur or puncturevine fruit. Many other species from cacti to blackberry brambles or certain tree species also produce a wide array of thorns and spines. Wounds induced in this manner can be quite painful, and while infection may occur without proper treatment, such wounds are usually not fatal. Fortunately, avoidance of these species or simple protective gear can usually reduce the extent of mechanical injury.

Mechanical injury may be an inconvenience (albeit a painful one), but recovery is almost certain. However, ingestion of poisonous plants can result in serious illness or death. There are over 700 plant species that are known to induce illness in humans. As with contact dermatitis, toxicity is related to plant parts (fruit, leaf, stem, or root), as well as stage of growth, weather, soil, and ecotype. Both edible and poisonous parts can exist on the same plant [e.g., rhubarb (*Rheum rhabarbarum* L.)]. Poison hemlock (*Conium maculatum* L.), oleander (*Nerium oleander* L.), and castor bean (*Ricinus communis* L.) are so poisonous that tiny amounts can be fatal if eaten. Ricin, the poison contained in the seed of castor bean, has a greater potency than cyanide. Seeds of jimsonweed (*Datura stramonium* L.) and other narcotic plants can also induce severe hallucinations and disorientation in which death may occur from secondary causes such as drowning or exposure. Young children may be particularly at risk because bright objects such as berries attract their attention. The National Poison Center lists poisonous plants as the second most frequently ingested toxic substance by children under 5 yr of age, with children younger than 1 yr accounting for $> 50\%$ of all accidental plant ingestions.

Given the widespread influence of weeds on human health, what is the role of the weed scientist in addressing

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these issues? Perhaps the first step is an expansion of our ideas of what constitutes a weed. Although some of the plants that alter human health, such as common ragweed or poison ivy, are widely recognized as weeds, other species would not be considered in the traditional weed category. However, for people who experience allergies, a wide range of trees, shrubs, and grasses would be considered as unwelcome, weedy species. Acknowledgment by weed scientists that such plant species have an undesirable effect on human society (aside from any agronomic effects) would serve to highlight the importance of weeds and human health. Such recognition would be essential in stimulating the type of research needed for control of such weedy species.

In addition, weed scientists should recognize that there are numerous opportunities to establish professional contact with the health care community. The term *weed scientist* really refers to a unique amalgamation of scientists with diverse academic backgrounds from traditional agronomy, to plant physiology, to molecular biology. As a consequence, weed scientists could potentially provide critical information to the medical community regarding the toxicology, life cycle, and identification and distribution of plant species that affect human health. A simple example would be weed ecologists who study climatic or meteorologic factors, or both, that determine the distribution of common ragweed. Modeling of common ragweed distribution would be a key benefit to health care workers who can shift resources (e.g., antihistamines) to areas where higher pollen counts would be expected. A more complex example would involve the input of molecular biologists to assess the possibility of identifying and removing those proteins associated with allergenicity in common ragweed.

The role of weed scientists in agriculture has always been a difficult one, with the problems of the future no less daunting than those of the past. There will be many more people to feed in the coming century (up to five billion more by some estimates) and potentially large changes in climate. Weed control through mechanical, biological, or chemical means in traditional or sustainable agricultural systems will continue to define the role of weed scientists in maintaining food security. Yet, the effect of weeds on human health needs to be acknowledged, and the potential contributions that can be made by weed scientists in addressing health concerns need to be recognized and encouraged as weed science moves into the 21st century.

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