

Why study invasiveness in floricultural crops?

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An invasive plant is generally defined as one that arrives to a new location outside its range of distribution, establishes a sustaining population, spreads to other areas, and frequently causes an impact on the environment where it has been introduced. Some people erroneously make no distinctions between the terms invasive and non-native or exotic; this misconception has prompted several gardeners to favor exclusively the use of native plants over non-native plants. However, important distinctions exist between invasives and non-natives. Not all non-natives are invasive and some natives can become invasive in certain conditions, for example along roadsides and around frequently disturbed sites (wild sunflowers, poison ivy). Moreover, since only a few of all exotics have become invasive, use of these terms interchangeably can lead to unsubstantiated conclusions with major consequences to those who rely on plant introductions for trade.

New crop introductions are recognized as a major environmental risk to native biodiversity, even

when only a small percent of introduced organisms naturalize or become invasive. Over 60,000 plant species and cultivars/varieties are available from nurseries and seed producers in the U.S. and Canada (Isaacson 1996); approximately 150 are considered truly invasive (Marinelli 1996). The few that have become invasive can cause dramatic changes in native vegetation. For example, purple loosestrife forms large stands that exclude all other wetland plants, transforming a diverse community to one with a single species (Anderson and Ascher 1993). This may affect organisms that depend on existing vegetation for food and habitat. Invasive plants can also change the frequency of wildfires, the availability of light, water or nutrients, and soil erosion rates.

The horticultural trade is the sector of agriculture responsible for domesticating and commercializing the highest number of exotic/native species that have the greatest risk of becoming invasive. Within horticulture, floriculture is responsible for the greatest number of introductions. Domestication of new

crops has become a major emphasis within the industry. More than 100 new crop species have been domesticated and introduced in the past decade and this rate is unlikely to decline. Flower seed and vegetative breeder/producer companies are scouring the globe for new crops to introduce.

Weedy species are easily adaptable to cultivation and require little domestication, although if a species is determined to be too aggressive, most companies will not introduce it. Classic examples of floricultural crops that have become invasive in the U.S. include: Hottentot Fig (*Carpobrotus edulis*), Pampas Grass (*Cortaderia jubata*, *C. selloana*), Over-the-Garden-Gate (*Fallopia japonica* or *Polygonum cuspidatum*), Lantana (*Lantana camara*), Oxeye Daisy (*Leucanthemum leucanthemum*), Butter and Eggs (*Linaria vulgaris*), Purple loosestrife (*Lythrum salicaria*), Eulalia (*Miscanthus sinensis*), and Fountain Grass (*Pennisetum purpureum*, *P. polystachyon*, *P. pedicellatum*). Several new crops commercialized for the worldwide market are

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already becoming invasive: Mexican Mint (*Agastache rugosa*), Common Pimpernel (*Anagallis arvensis*), Pennywort (*Cymbalaria muralis*), Gaura (*Gaura lindheimeri*), and South American Vervain (*Verbena bonariensis*).

The main obstacle in the process of regulating new floricultural crops, however, is predicting invasive potential. Scientists are still trying to determine what makes a species a successful invader and which environments are more susceptible to invasions than others. Several studies indicate that some plant traits are associated with invasive potential. For example, invasive species generally reproduce within the first few years, produce many seeds that are dispersed by animals, have long flowering and fruiting periods, lack special germination require-

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ments, and have the ability to spread vegetatively (Randall 1996).

Classification of invasion potential based on these and other traits may be used to identify plants that pose the greatest risk (Rejmanek and Richardson 1996).

Predicting invasiveness based on geographical, ecological and biological traits has been an approach taken to assess invasive potential of plants in

Australia and New Zealand (Pheloung 1995), alien woody plants in South Africa (Tucker and Richardson 1995), naturalized weeds in New Zealand (Owen et al. 1996), and woody plants in N. America (Reichard and Hamilton 1997). Little attention has been placed, however, to minimize invasive potential during the breeding, selection, and trialing process, especially with floricultural crops. The herbaceous perennial breeding program at the

University of Minnesota is focusing research on this subject. Nadilia Gomez, a PhD student, is currently researching this topic. In addition, a new center--The Invasion Biology Research Consortium--has been established that will bring U of M scientists together to spawn cooperative research efforts across disciplines.

Studying invasive potential of ornamental crops is important for several reasons: information is limited on this particular topic, the rate of introduction of floriculture crops is greater now than ever before, understanding of invasive traits is necessary to develop adequate risk assessment studies and establish regulations that minimize detrimental consequences to floriculture. Regulations on species introductions are tightly linked to trade and market. Invasive species have triggered controversial discussion regarding regulatory mechanisms especially among horticultural industries. Still (2000) stated that "it would be irresponsible to market damaging crops, but it would also be irresponsible to ban crops that are invasive or damaging in very limited settings or actually not at all".

Complete eradication of an invasive species once it is established is difficult. Therefore, prevention is still the best way to reduce

the risk of potentially dangerous introductions. Significant research needs to be conducted on the invasive potential of floricultural introductions. There are many suggestions for controlling invasive taxa, from outright importation bans of all new exotics (environmentalist's position), importation of any species that is not on the noxious weed list (current US policy, breeder's position), importation of species only if they "pass" an invasiveness test and submitting any questionable species to further testing (Australian), to self-regulation (large company's position). At the breeder level, however, it may be possible to select against traits correlated with invasiveness.

Current research in the *Gaura* breeding program at the U of M will be used to demonstrate proactive approaches in preventing the development of invasive products. Future research also needs to be devoted to the documentation of invasive species (acreage of infestation), development of predictors for crop invasion potential, selection against invasive potential in breeding programs, and feasible regulatory mechanisms before there is a global crisis with negative impacts on the floriculture industry.

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