Plastics Guide for Floral Industry *Growers*

Sustainabloom™
by the American Floral Endowment

Part of the American Floral Endowment's ***Sustainabloom*** *Program*

Why Care About Plastics?

The surge in plastic production in recent years has resulted in a substantial accumulation of non-recyclable plastic waste.

These plastics have the potential to accumulate within landfills, soil, water ecosystems, and impact the biological systems of animals and plants (National Science Foundation, 2021).

Because of its chemical structure, a single plastic item can take hundreds to thousands of years to break down completely. As it breaks down, chemical additives and stabilizers from the manufacturing process are released, which harm the natural environment around it (Soulliere-Chieppo, 2020). One estimate places nearly 98% of plastic pots in landfills at the end of their life cycle (Nambuthiri et al., 2015).

Where to Start

So what can be done about plastic use and consumption? Blanke (2023) recommends the four "R" approach for the sustainability assessment of plastics use in horticulture:

- **Reduce:** based on plastic type with considerations for density and longevity;
- **Reuse:** reduce single-use plastics and find ways for repeated use;
- **Recycle:** track plastic retrieval rates and increase the chance of recycling; and
- **Replace:** find plastic alternatives for the same purpose.

Common Recycle Codes

Plastics are categorized at recycling facilities by standardized codes to identify the materials used to create the product. Check with your local facility to see which categories are accepted. Common horticultural plastics include:

- #2: High-Density Polyethylene (HDPE)
  - Large nursery containers
  - Irrigation piping
- #4: Low Density Polyethylene (LDPE)
  - Mulching
  - Greenhouse cover
- #5: Polypropylene (PP)
  - Plant containers
- #6: High Impact Polystyrene (HIPS)
  - Flat trays, carrier trays, plug/propagation trays, shuttle trays

HDPE

Guide For:

- ☑ Growers
- ○ Transporters
- ○ Wholesalers
- ○ Suppliers
- ○ Retailers / Florists

PLASTICS AT A GLANCE

Plastic appears in every phase of the horticultural lifecycle, including seed packaging, planting, propagation, mulching, irrigation, harvesting, packing, and preservation (Patel & Tandel, 2017). In floristry, plastics are used to sleeve bouquets and bunches, as design containers and potted containers, and in the growing process.

MEASURING PLASTIC USE IN THE FLORICULTURE INDUSTRY

Comprehensive data on the overall plastic usage in horticulture is difficult to find. The Food and Agricultural Organization estimates global crop and livestock production consumes approximately 10 million tons of plastic each year. In the United States, the ornamental horticulture sector's plastic consumption is 830,000 tons annually (Nambuthiri et al., 2015).

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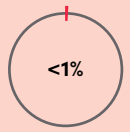
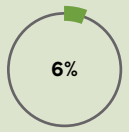
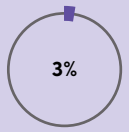
THE 7 TYPES OF PLASTICS

THEIR TOXICITY AND WHAT THEY ARE MOST COMMONLY USED FOR

POLYMER NAME	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYETHYLENE	POLYSTYRENE	ALL OTHER PLASTICS Including, acrylic, fiberglass, nylon, polycarbonate, & polyactic acid (a bioplastic)
Resin Identification Code							
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (difficult to do)	Difficult to Recycle
Percentage Recycled Annually							
How Long to Decompose Under Perfect Conditions	**5-10 Years**	**100 Years**	**Never**	**500-1,000 Years**	**20-30 Years**	**50 Years**	Majority of these plastics: **Never** Polyactic acid: **6 months**
Maximum Temperature	**70°C** (158°F)	**120°C** (248°F)	**70°C** (158°F)	**80°C** (176°F)	**135°C** (275°F)	**90°C** (194°F)	Plycarbonate: **135°C** (275°F) Polyactic acid: **150°C** (302°F)
Brittleness Temperature	**-40°C** (-40°F)	**-100°C** (-148°F)	**-30°C** (-22°F)	**-100°C** (-148°F)	**0°C** (32°F)	**-20°C** (-4°F)	Plycarbonate: **-135°C** (-211°F) Polyactic acid: **60°C** (140°F)
Toxicity Level	**HIGH**	**LOW**	**HIGH**	**LOW**	**LOW**	**HIGH**	**HIGH**
Most Commonly Leached Toxin(s)	Antimony Oxide, Bromine, Diazomethane, Lead Oxide, Nickel Ethylene Oxide, & Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, & Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, & Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, & Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, & Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alchol, Antimony Oxide, & Tert-butyl Hydroperoxide, Bensoquinone	BPS, BPS, as well as other toxins mentioned
Floral Uses	Clamshells (boutonniere or food grade)	Non-food grade 5-gallon buckets, Heavy poly bags (i.e., bags in which stones come in), nursery and greenhouse pots*, soap dispenser containers*		Plastic sleeves, grocery style shopping bags, and food grade 5-gallon buckets, plastic wrap, trash bags	Candy and chocolate packaging, Clear adhesive tape, plastic storage boxes, greenhouse and greenhouse pots*	Nursery and greenhouse pots*, packing materials (i.e., peanuts) from container and delicate florals boxes, plastic utensils, cardholders, storage containers, brush and broom handles, soap dispenser containers*, cleaning supplies containers*	Many types of design bowls*, acrylics, cleaning supplies containers*

*If you're not sure which category of plastic type your item fits into, check on the bottom of the item for the triangle with the number inside, or the box that the item came in. The distributor has to label what type of plastic the item is on packaging.

1 POLYETHYLENE TEREPHTHALATE (PET OR PETE)

COMMONLY USED FOR

- Water Bottles
- Peanut Butter Jars
- Rope
- Caps
- Combs

CAN BE RECYCLED INTO

PET is commonly recycled, although it should not be reused

- Fleece Garments
- Carpets
- Storage Containers
- Stuffing for Pillows, Winter Jackets, & Sleeping Bags

2 HIGH-DENSITY POLYETHYLENE (HDPE)

COMMONLY USED FOR

- Shampoo Bottles
- Grocery Bags
- Milk Jugs
- Toys
- Park Benches

CAN BE RECYCLED INTO

HDPE is the most commonly recycled plastic and can also be reused

- Plastic Bottles & Jugs
- Outdoor Furniture
- Playground Equipment
- Fencing
- Ropes
- Toys

3 POLYVINYL CHLORIDE (PVC)

COMMONLY USED FOR

- Cleaning Products
- Sheetings
- Garden Hoses
- Credit Cards
- Window & Door Frames

CAN BE RECYCLED INTO

Almost all products using PVC requite virgin material for their construction

- Flooring
- Traffic Cones
- Credit Cards
- Paneling

4 LOW-DENSITY POLYETHYLENE (LDPE)

COMMONLY USED FOR

- Bread Bags
- Plastic Films
- Garbage Bags
- Hot & Cold Beverage Cups
- Food Storage Containers

CAN BE RECYCLED INTO

LDPE is difficult to recycle, although more plastic recycling programs are gearing up to handle this material

- Plastic Lumber
- Compost Bins
- Trash Cans
- Floor Tiles

5 POLYETHYLENE (PP)

COMMONLY USED FOR

- Yogurt Cups
- Straws
- Hangers
- Potato Chip Bags
- Prescription Bottles

CAN BE RECYCLED INTO

PP is one of the least recycled plastics & a majority of it ends up in landfills

- Shipping Pallets
- Brooms
- Shovels
- Watering Cans
- Cutting Boards

6 POLYSTYRENE (PS)

COMMONLY USED FOR

- Take-Away & Hard Packaging
- Toys
- Plastic Cutlery
- Foam Packaging

CAN BE RECYCLED INTO

Recycling is not widely available for polystyrene

- Egg Cartons
- Picture Frames
- Moldings
- Home Décor Products

7 ALL OTHER PLASTICS

COMMONLY USED FOR

- Baby Bottles
- Nylon
- CDs
- Eyeglasses
- Multiple-gallon Water Bottles

CAN BE RECYCLED INTO

Items made from #7 plastics are a combination of various plastics and are difficult to recycle. Products marked #7 with "PLA" cannot be recycled but can be composted.

Innovation in Plastics

Industry Spotlight: Jiffy

Sustainable pots in horticulture go all the way back to the 1950s, with the original Jiffy Pot. The pots are made from peat and wood pulp and can be planted in the ground to biodegrade over time. The original Jiffy Pot and its descendants are suitable for multiple types of irrigation systems and come in sizes up to one gallon.

Learn More at https://jiffygroup.com/products/jiffy-pots

Industry Spotlight: HC

Sustainability is a competitive advantage companies can have if they are a leader in that space, says Tom Marting, the director of Sustainable Solutions at HC Companies.

“We all need to be thinking about sustainability because the future will be different than the past,” Marting says.

Plastics are produced from byproducts of petroleum refining, and climate goals necessitate individual and collective reductions in fossil fuel consumption which will result in plastic supply constraints in the long term.

HC Companies, for example, is using sustainable alternative materials such as recycled paper fibers for pots and hanging baskets in their EcoGrow containers, which are 100 percent bio-based. They also utilize wood-derived, cellulose-based compostable materials in their BioPax bioplastic containers.

Robust recycling programs are an aim, too. So how can manufacturers of plastic products encourage recycling?

“I like to use a sports analogy,” Marting says. “I can throw a pass, but I can’t guarantee someone will catch and run across the goal line. While we can design with recyclability in mind, someone has to take responsibility down the value chain and get it to the recycling facility. It is a team effort.”

He envisions a cooperative effort throughout the entire value chain where the horticultural industry can educate consumers about how to recycle and where. HC Companies is doing their part by committing to using increasing amounts of post-consumer recycled plastics and designing products for recyclability.

To improve recycling rates from the consumer end, Marting recommended moving away from labels, which need to be removed during recycling and can make containers difficult to recycle. He also advises growers, wholesalers, and retailers aiming to sort plastics by the standard recycle codes and ensure plastic containers are cleaned and stacked to aid acceptance at local recycling facilities. Unfortunately, not all geographic areas have the same recycling capabilities, so it is important for companies to work with their local recyclers to ensure the plastic products are recovered for recycling.

Learn More at https://hc-companies.com/recycling-programs/

Innovation in Plastics

Return On Investment

The floriculture industry can benefit in multiple ways from adopting recycling and reduction strategies including in energy savings, economic advantages, and increased consumer engagement. East Jordan Plastics has adopted a robust recycling program that highlights incorporating recycled plastic to create containers and trays and found conservation of up to 60% of the energy compared to producing the same items from virgin materials.

Proactively keeping containers out of dumpsters and landfills and engaging in recycling can also decrease the expenses associated with waste removal. In benefits regarding consumers, by aligning with the growing trend of eco-friendly choices, especially in the realm of biodegradable plastics, the floriculture industry can tap into an expanding market segment. Business could incorporate recycling programs such as encouraging customers to return plastic pots and trays and offering a small discount or incentive (Blanke and Golombek, 2021). This not only contributes to sustainability efforts but also serves as a catalyst for heightened consumer engagement. In embracing strategies of reuse and reduction, the horticulture industry can contribute to environmental preservation, and benefit from energy savings, resource conservation, waste reduction, and an increased engagement and appeal from a growing market that prioritizes sustainable choices.

For growers, standard black plastic mulch also has a wide range of sustainable alternatives, including biodegradable mulch and cloth landscape fabric (Blanke, 2023).

Compostable Plastics

Compostable plastic, as defined by the International Organization for Standardization standards, is plastic that can degrade into carbon dioxide, water, inorganic compounds, and biomass and leave no toxic residue.

What sets compostable plastic apart is its accelerated rate of decomposition compared to biodegradable plastics, particularly under specific environmental conditions that foster its breakdown. These conditions are typically met within controlled settings such as industrial composting facilities, where factors like regulated temperatures, humidity, and microbial activity help facilitate the composition. It's important to recognize that 'compostable' falls under the broader category of biodegradable, but the reverse is not always true. In other words, while compostable plastic is always biodegradable, not all biodegradable plastics are compostable. This is because not all biodegradable plastics meet the criteria for compostability.

Some biodegradable plastics do not exhibit the same degradation rate as other compostable plastics or guarantee the absence of toxic residue.

To identify compostable plastics, one can search for indicators like the "#7 PLA" symbol on the plastic item, the explicit labeling of "compostable," or certification from authoritative bodies such as the Biodegradable Products Institute (BPI).

1

STARCH-BASED COMPOSTABLE PLASTICS

These plastics are derived from starches such as maize, wheat, potato, and cassava. One example is Thermoplastic Starch (TPS), which is crafted from corn starch and glycerol. TPS is used as a substitute for traditional plastic mulch and also as an alternative to petroleum-based packaging (Bangar, 2021).

2

CELLULOSE-BASED COMPOSTABLE PLASTICS

Cellulose-based plastics originate from plant cell walls found in biomass materials like trees, cotton, hemp, and wood pulp. For example, Cellulose Acetate (CA), is water-resistant and well-suited for packaging applications (Kinhal, n.d).

3

BACTERIA-BASED COMPOSTABLE PLASTICS

These plastics are produced through bacterial fermentation, including Polyhydroxyalkanoate (PHA). PHA's attributes such as resilience to UV rays, stiffness, and insolubility in water (Sharma et al., 2020) make it suitable in packaging and containers as a replacement for polyethylene and polystyrene (Lee, 1996).

4

FOSSIL FUEL-BASED COMPOSTABLE PLASTICS

This type of plastic can exhibit characteristics like toughness and resistance to moisture and gases, making it suitable for various applications including wrapping films, packaging, shopping bags, mulch films, greenhouse films, and silage covers (Europlas, n.d).

Learn More

SCAN ME!

Sustainabloom™ by the American Floral Endowment

Sustainabloom is an industry-wide program created by the American Floral Endowment to provide easy-to-use resources and educational guides around key areas of sustainability, including plastics use, composting, substrates, carbon accounting, and much more.

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