Plastics Guide for Floral Industry *Retailers*

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, chemicals like 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).

Microplastics are tiny plastic particles resulting from the breakdown of larger plastics and commercial product development. They stem from primary sources like cosmetics or manufacturing processes, as well as secondary sources such as fragmented larger plastic pieces. In horticulture, this can come from plastic mulching, plastic seed coating, irrigation tubes, and more (Tian et al., 2022; He et al., 2023). As these plastics break down, they transform into microplastics, impacting the environment. Of particular concern is the combination of microplastics with additives, many of which contain toxic elements. This combination holds a high potential to contaminate and leach into the soil, air, water, and organisms according to ongoing research (Campanele, 2020).

The interest in alternatives to plastics has been growing within the consumer market. A large segment of floriculture consumers want sustainable, recyclable, and reusable products (Etheredge et al., 2023). Consumers are turning to sustainable alternatives to meet their needs (Yue et al., 2011). This demand has driven some of the change that is seen in the horticulture and floriculture markets currently. In one survey, three-fourths of consumers were willing to pay more for bioplastics as opposed to conventional plastics (Zwicker et al., 2020)

Where to Start

So, what can be done about plastic use and consumption? Blanke (2023) recommends a four "R" approach for a 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.

Guide For:

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

PLASTICS AT A GLANCE

Plastic appears in every phase of the horticultural lifecycle, from seed packaging, planting, propagation, and mulching to irrigation, harvesting, packing, and preservation (Patel & Tandel, 2017). In retail 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). However, the amount of plastic usage in floristry is unquantified to date However, the amount of plastic usage in floristry is unquantified to date

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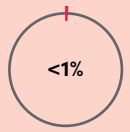
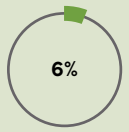
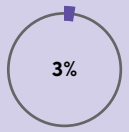
THE 7 TYPES OF PLASTICS

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.

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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

Plastic Certifications for Floriculture Products

Plastic is a versatile and durable material that can be used for various purposes in floriculture. However, not all plastics are created equal and can have negative impacts on the environment and human health. To mitigate these negative impacts, producers and consumers should look for plastic products that have been certified by reputable organizations. These certifications can vouch for the plastic products' environmental quality and safety. This section will include four main categories of plastic certifications that are relevant for floriculture plastic products: recycled content, bio-based, biodegradable or compostable, and sustainability.

- **Recycled Content:** Recycled content certificates work to verify the percentage of a product made from recycled content or recycled materials. An example is the Recycling Content certification by SCS Global Services, which verifies that a product was made from recycled content or recycled materials. This certification is for product manufacturers and can include post-consumer or pre-consumer recycled content.
- **Bio-Based Certifications:** Biobased products encompass items made wholly or significantly from renewable agricultural, chemical, and forestry materials sourced from plants or other renewable resources. An example is the USDA's BioPreferred Program which verifies the amount of renewable biobased materials by comparing plant-based carbon to fossil fuel-based organic carbon in the material.
- **Biodegradable or Compostable Certifications:** These certifications can validate that the product has been independently tested and verified to meet set compostable standards. An example is certification from the Biodegradable Products Institute (BPI) which confirms that the material meets the criteria for being biodegradable or compostable in the right environment.
- **Sustainability Certification:** Sustainability certifications primarily focus on assessing how well organizations incorporate sustainable practices. When it comes to plastics, these standards examine aspects such as energy consumption, waste management (including processing, separation, and reduction), and other relevant factors. One example is the MPS-ABC certification, which can evaluate whether a minimum of 95% of the plastic and plastic waste undergoes reuse or recycling.

Industry Spotlight

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.

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/

Biodegradable/ Compostable Sleeves

Plastic sleeves are often relied on to preserve the quality and presentation of flowers for consumers. They are commonly made from polyethylene terephthalate (PET #1), low-density polyethylene (LDPE #4), or polypropylene (PP #5)*.

For those looking for more sustainable alternatives, biodegradable and compostable sleeves offer many advantages. This includes cost efficiency, meeting increased consumer demand, and reducing environmental impact. While plastic may seem cost-effective upfront, sustainable options provide long-term benefits by reducing waste and its associated costs, reducing logistics costs in storage, transportation, and shipping, and providing insurance against potential environmental regulations.

One example of a biodegradable alternative is paper sleeves. A recent assessment comparing various sleeve materials – including polypropylene (PP), low-density polyethylene (LDPE), and paper – revealed that paper sleeves are the most sustainable choice (Royal FloraHolland, 2023). For those looking to enhance the sustainability of their sleeves, consider transitioning paper sleeves, incorporating more recyclable materials, and minimizing practices that hinder recycling, such as printing on the sleeve. Printing, while useful for branding, can have harmful environmental consequences and act as a contaminant in the recycling process (Royal FloraHolland, 2023).

*To identify the type of plastic used, look for indicators on the packaging or shipping boxes specifying the recycling code.

Plastic Pots

Plant containers and pots are commonly made from Polyethylene Terephthalate (PET #1), high-density polyethylene (HDPE #2), low-density polyethylene (LDPE #4), polypropylene (PP #5), and high-impact polystyrene (PS #6).

To tackle plastic waste effectively, one approach is to choose plastic that's more readily recyclable, such as PET, HDPE, LDPE, or PP. In contrast, polystyrene pots, though technically recyclable, are rarely recycled due to high contamination. Additionally, seek out pots that adhere to sustainable standards related to recycled content, such as The Recycled Claim Standard (RCS) or Global Recycled Standard (GRS). Another point to consider is the reduction of black plastic pots as they are non-recyclable due to the dye used, which hinders the breakdown process.

Plastic pots are not the only choice. Alternatives can include opting for bioplastics, which are made from renewable biological sources instead of non-renewable petroleum-based resources. This can include polylactic acid (PLA) – derived from starch, which is most commonly used.

Other alternative sources to plastic can include compostable and biodegradable pots, sourced from rice hulls, recycled paper, cardboard, soy, wheat starch, and other natural fiber waste products.

Floral Design Containers

Floral arrangement design containers most commonly use plastic, which is inexpensive compared to other materials. They commonly consist of High Density Polyethylene HDPE (PE #2), Low Density Polyethylene (LDPE #4), Propylene (PP #5), and Polystyrene (PS #6), or Polycarbonate (BPA #7)*.

Best practices include using recyclable material to avoid single-use plastic. The most recyclable plastics include HDPE, LDPE, and PP. Polystyrene pots, while they can be recycled, typically are not due to high levels of contamination.

One effective strategy for mitigating plastic waste is to use recyclable and recycled materials. Some options include containers made from recycled plant fibers, such as rice hulls, coconut coir, or bamboo, or containers made from post-industrial grade recycled plastic, which have a lower carbon footprint than virgin plastic. Another alternative to plastic containers is to use other materials, such as glass, ceramic, basket, or metal.

*To identify the type of plastic used, look for indicators on the packaging specifying the recycling code.

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).

References

East Jordan Plastics' 150,000-square-foot recycling facility in South Haven, Michigan can process polypropylene and polystyrene – both commonly used for horticultural containers with limited recycling options – and the company makes 100 percent recyclable plant trays, pots, and containers. Learn more about their closed-loop plastics recycling efforts. https://www.greenhousemag.com/form/why-plastic-recycling-is-vital-for-horticultural-sustainability/

Read about the global use of plastics in agriculture in the Food and Agriculture Organization's Assessment of Agricultural Plastics and Their Sustainability. https://www.fao.org/3/cb7856en/cb7856en.pdf

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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