‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’: Novel Pumpkin Cultivars with Reverse Striping

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In North America, pumpkins (*Cucurbita* spp.) are almost exclusively thought of as Halloween adornments or a key pie ingredient. However, they have been grown around the world for various purposes for centuries. A nutritious food source, culinary pumpkin fruit are rich in potassium, fiber, and carotenes. As a common Halloween symbol, pumpkins bring economic prosperity to commercial pumpkin growers, rural farmers, and innumerable gardeners throughout the fall months (Robinson and Decker-Walters, 1997).

Most pumpkins belong systematically to *Cucurbita pepo* L., *C. maxima* Duch., *C. moschata* Duch., and *C. argyrosperma* C. Huber. They are markedly diverse in fruit shape, size, and color (Esteras et al., 2012; Merrick, 1990; Paris, 1996; Whitaker and Robinson, 1986). Pumpkins range in size from a few hundred grams to more than 500 kg, and vary in shape with round, globular, tall, oval, and flat forms. Orange is the most common mature color, but pumpkins come in orange, brown, yellow, white, green, red, blue, mottled, striped, and black (Goldman and Schrager, 2004; Paris, 2009; Smith, 2018). For elite pumpkin cultivars developed for cucurbit growers, the seed industry, and consumers, most breeding efforts of Hollar Seeds research have been for specific desirable traits such as good fruit appearance (size, color, shape, smoothness), thick handles, good growth habit, high yield, high flesh quality, and resistance to powdery mildew (*Podosphaera xanthii*, *Golovinomyces cucurbitacearum*) (Zhang, 2012, 2013; Zhang et al., 2012).

Reported here are four new pumpkin hybrids of *C. pepo*—‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’—with intensive yellow and orange reverse-striping color patterns. All four hybrids have powdery mildew resistance (PMR). ‘Spark’ and ‘Flame’ are miniature pumpkins developed for dual-purpose use as decoration and consumption; ‘Blaze’ and ‘Fury’ were created as small and

large Halloween pumpkins, respectively, for decoration and carving. These cultivars provide pumpkin growers, farmers’ markets, and Halloween fans with more extensive choices.

Origin

‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’ were derived from crosses of Hollar parent lines (CarnxH7B1)BC₂₂F₃₁-2-1-1, (CarnxJBL)BC₁F₃₁-1-3-1, (CarnxH7B1)BC₂₂F₃₂-1-1-1-1, HF521, and ThickStemS₁-2-1, which were developed through backcross and pedigree breeding procedures from 2005 to 2017. Germplasm used for the development of reverse striped lines with PMR were two Hollar pumpkin cultigens—‘Jill-Be-Little’ (JBL) and PMR

pumpkin ‘H7B1’ (Zhang, 2012, 2013)—and a commercial acorn winter squash cultivar ‘Carnival’ (Harris Seeds, Rochester, NY). ‘JBL’ is a miniature pumpkin (≈260 g) with an orange color, flat shape, ribs, and PMR. ‘H7B1’ has orange, globe-shaped fruit weighing ≈10 kg and has PMR. ‘Carnival’ weighs ≈700 g and has heart-shaped fruit with grooves and a mottled color. HF521 and ThickStemS₁-2-1 were Hollar’s existing lines, which were developed before the striped lines. HF521 is a small winter squash (≈500 g) with a flat, heart shape; grooves; and mottled color. ThickStemS₁-2-1 is a large pumpkin (≈20 kg) with a globe shape and orange color.

Genetically conferred traits for PMR, fruit size, shape, and so on, were recombined into BC₁F₂, BC₂F₂, and the new breeding families and lines of later generations. Selections were focused on the targeted traits and proceeded with two generations per year, alternating between the greenhouse and field, and continuing for eight generations. Promising lines were intercrossed and hybrids evaluated when they reached the fifth generation. Inbred lines expressing reverse stripe and appropriate size and shape were narrowed down to (CarnxH7B1)BC₂₂F₃₁-2-1-1, (CarnxJBL)BC₁F₃₁-1-3-1, and (CarnxH7B1)BC₂₂F₃₂-1-1-1-1. Together with HF521 and ThickStemS₁-2-1, five parent lines were used to generate the four F₁ hybrids that were first assigned the Hollar research numbers ‘HSR4733’, ‘HSR4734’,

Fig. 1. Striped miniature pumpkins for dual-purpose use as decoration and consumption. (A) ‘Spark’ plant with powdery mildew resistance and striped fruit. (B) ‘Flame’ plant with moderate resistance to powdery mildew and striped fruit.

Fig. 2. Striped small and large pumpkins for carving and decoration. (A) ‘Blaze’ plant with powdery mildew resistance and striped small fruit. (B) ‘Fury’ plant with powdery mildew resistance and striped large fruit.

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Table 1. Powdery mildew resistance (PMR), fruit characteristics, mesocarp dry weight (DW), and yields of ‘Spark’, ‘Flame’, ‘Blaze’, ‘Fury’, and two commercial mini pumpkins compared over the years 2015–17 at Rocky Ford, CO.

Cultivar	PMR level ²	Fruit color ³	Fruit wt ⁴ (kg)	Mesocarp DW ⁵ (%)	Yield ⁶ (t·ha ⁻¹)
Mini pumpkins					
Spark	4.7 a	Orange Group25B/Yellow-Orange Group21b	0.3 d	22.4 a	15.5 c
Flame	1.2 b	Orange Group24b/Yellow-Orange Group19d	0.5 b	20.9 bc	19.9 a
Hooligan	0.0 c	Orange Group25c/Yellow-White Group158b	0.4 c	21.5 b	15.6 c
Pump-Ke-Mon	0.0 c	Orange Group24a/Orange-White Group158d	0.6 a	20.6 c	19.0 b
Small and large pumpkins					
Blaze	4.8 a	Orange Group24a/Yellow Group4a	1.5	—	20.3
Fury	4.9 a	Orange Group24b/Yellow Group4b	20.2	—	51.9

²PMR level is the mean of PMR scores of 30 plants from each replication over 3 years. PMR was scored in six rating categories: 4–5 = highly resistant, 1–3 = moderately resistant, and 0 = susceptible. The means within the column bearing the same letters were not significantly different at the 5% level by Duncan’s multiple range test.

³Fruit color was based on the Royal Horticultural Society color chart (1986). The color before the forward slash is located in the grooves; the color after the forward slash is located on ribs.

⁴Mean of the single weight of 30 fruit from each replication over 3 years. The means bearing the same letters were not significantly different at the 5% level.

⁵Percent DW values are detransformed means from transformations for variance stabilization and statistical comparisons.

⁶Mean yield of mature fruits extrapolated to a hectare basis from each of three replications over 3 years in 69-m² plots.

‘HSR4730’, and ‘HSR4728’. At the same time, these crosses were tested on the Hollar Seeds’ trial ground of Rocky Ford, CO, and in the local trials of Hollar Seeds’ distributors in Stockton, CA; Canby, OR; Elizabethtown, PA; Albion, ME; and Ontario, Canada. Based on the test results, the four hybrids were named and released as F₁ ‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’ (Figs. 1 and 2).

Description and Performance

Reverse stripe appearance in ‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’ is similar, but they differ in contrasting color of striping, shape, size, ribs, and PMR. Descriptions of fruit color are based on comparison with the Royal Horticultural Society (RHS) color chart (1986). The four hybrids have a reduced-vine growth habit with a shorter internode, a thicker stem, and more upright growth, which supports more plants per unit area compared with full-vine cultivars. Two commercial mini pumpkins of Harris Seeds—‘Hooligan’ and ‘Pump-Ke-Mon’—were used as comparisons in the trials. Field plot (30 × 2.3 m) trials were conducted with a completely randomized design, with three replications containing 30 plants each at Rocky Ford, CO, in 2015–17. Soil type was a silty clay loam. The cultigens were seeded directly on the raised beds and spaced 0.9 m within rows and 2.3 m between rows. The plots were irrigated weekly beginning the middle of May and were fertilized six times with soluble compound fertilizer having an elemental ratio of 3N–1P–2K at rate of 20 kg·ha⁻¹ during the growing season using subsurface drip tapes that were placed 20 cm below the beds. When powdery mildew occurred in the field, PMR was evaluated after the midseason. PMR was divided into six levels, 0 through 5, where 0 indicates that the plants were 100% infected and susceptible, and 5 indicates that the plants were highly resistant and had no symptoms of the disease. A 1-point increase is equivalent to an increase of 20% uninfected area on a leaf and a stem (Cavatorta et al., 2012; Zhang, 2013). Data on fruit characteristics, including color, shape (height and width),

size (weight), and yield were collected in accordance with maturity for the four cultivars. At the same time, dry weight (DW) was estimated by sampling shoulder mesocarp tissue of 30 fruit (each 20 g; total, 600 g) for each replication, then drying the samples in a forced hot-air oven for 48 h at 68 °C.

‘Spark’. This mini pumpkin has a distinctive flat shape with medium ribbing accentuated by narrow, dark-orange stripes (RHS Orange Group25B) in vein tracts and a yellow (RHS Yellow-Orange21B) background color in mature fruit (Fig. 1A). The 250-g fruit (Table 1) are usually harvested at a mature stage, ≈90 to 100 d after sowing. ‘Spark’ fruit are significantly smaller ($P \leq 0.05$) than ‘Hooligan’ and ‘Pump-Ke-Mon’, although they are all in the mini pumpkin category. ‘Spark’ is ≈100 g lighter and much flatter than ‘Hooligan’, and weighs less than half of the ‘Pump-Ke-Mon’ fruit. ‘Spark’ fruit are edible ≈45 d after pollination. The experiments in Colorado indicated that, within 45 to 55 d after fruit set, ‘Spark’ fruit had 22.4% DW of mesocarp tissue, which was significantly greater ($P \leq 0.05$) than ‘Hooligan’, ‘Flame’, and ‘Pump-Ke-Mon’ (Table 1). Its handle is green and strongly attached to the fruit. This cultivar has reduced vine and PMR.

‘Flame’. Apart from moderate PMR, ‘Flame’ has a compact and reduced vine that provides a concentrated fruit set. The fruit of ‘Flame’ have a flattened top with a deep shoulder and medium ribbing featuring dark-orange grooves (RHS Orange24B) and yellow ribs (RHS Yellow-Orange19D). The fruit reach maturity ≈95 d after sowing and average ≈500 g. Each weighs ≈150 g more than ‘Hooligan’ and ≈100 g less than ‘Pump-Ke-Mon’. Its yield is significantly greater ($P \leq 0.05$) than ‘Hooligan’ and ‘Pump-Ke-Mon’ (Fig. 1B; Table 1). The dual-purpose hybrid is an excellent ornament and also a high-quality winter squash.

‘Blaze’. This small pumpkin is distinguished by its brightly colored stripes in dark orange (RHS Orange Group24A) and bright yellow (RHS Yellow Group4A) on flattened

fruit. ‘Blaze’ has a strong plant with reduced vine and strong PMR, and sets multiple fruit. Its fruit have a long, dark-green handle, ensuring easy harvest and hand gripping. The maturity of the fruit is ≈100 d and weighs ≈1.5 kg (Fig. 2A; Table 1). The pumpkin can be used for both fall decorations and Halloween carving.

‘Fury’. This hybrid has a very large, strong plant with reduced vines and PMR that support development of large fruit. Fruit are global in shape with dull orange (RHS Orange Group24B) and yellow (RHS Yellow Group4B) stripes. Each weighs ≈20 kg and has diameter of 45 cm (Fig. 2B; Table 1). Its handle is dark green and is strongly attached to the fruit. The fruit mature around 110 d. This unique Halloween pumpkin gives an added and unexpected dimension to its traditionally colored counterparts.

Availability

‘Spark’, ‘Flame’, ‘Blaze’, and ‘Fury’ are being offered by Hollar Seeds to commercial distributors. Small samples of seed can be requested from Hollar Seeds, P.O. Box 106, Rocky Ford, CO 81067 (<http://www.hollarseeds.com/>).

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