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‘Bonnie’s Purple Majesty’: A Cultivar of the Endangered Sunflower *Helianthus verticillatus*

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The whorled sunflower, *Helianthus verticillatus* Small, is listed as a federally endangered plant (US Fish and Wildlife Service 2014) and is only found in relatively small numbers of individuals in the southeastern United States (Mandel 2010; Moore et al. 2022). We described a cultivar of this sunflower, Denita’s Autumn Sunshine (Trigiano et al. 2024), which was selected as a superior plant from a plot of mixed genotypes. In the present report, we have developed and evaluated a new and unique cultivar of *H. verticillatus*, Bonnie’s Purple Majesty.

‘Bonnie’s Purple Majesty’ is a variant of the typical phenotype of *H. verticillatus* as exemplified by ‘Denita’s Autumn Sunshine’ (Trigiano et al. 2024). Clones of both ‘Bonnie’s Purple Majesty’ and ‘Denita’s Autumn Sunshine’ were vegetatively propagated by stem cuttings in May 2020 (Trigiano et al. 2021, 2024) and were evaluated for horticultural characteristics for 4 years (2021 to 2024) at three disparate locations in Knoxville, TN, USA. To see additional information on cultivar development and biology of the whorled sunflower, refer to Trigiano et al. (2024).

‘Bonnie’s Purple Majesty’ differs physically from ‘Denita’s Autumn Sunshine’ in having highly variable stem color (Fig. 1A and B; Table 1), smaller leaves (Fig. 1C; Table 1), shorter mean height of the mature flowering plant (Table 1), and shorter length of the ray flowers (Table 1). The two cultivars were also distinguishable from each other by genotype analyses based on simple sequence repeats (Table 2) developed for *Helianthus* species (Edwards et al. 2020; Pashley et al. 2006).

Both cultivars followed similar temporal developmental patterns in all 4 years as reported in Trigiano et al. (2021, 2024). Many aerial stems emerged from dormant rhizomes in late February and grew linearly until axillary budbreaks occurred in mid to late July (Fig. 2A) and formed flower buds by late August to early September. Both cultivars were in full bloom and visited by a multitude of presumptive pollinators (Strange et al. 2020) by midlate September (Fig. 2B and C). Senescing inflorescences of ‘Bonnie’s Purple Majesty’ were covered by wax paper pollination bags (Midco Global Town and Country, St. Louis, MO, USA) in early October to collect any seeds that may have formed. Filled seeds were recovered from ‘Bonnie’s Purple Majesty’ in early November and stored at room temperature (Trigiano et al. 2021). Sixty filled seeds were imbibed with distilled water from moistened filter paper for 3 d and then stained with 0.5% tetrazolium in distilled water, a presumptive test for viability (Elias and Garay 2024) for 2 d. There was no development of red-colored seed tissues, which indicated that all seeds did not respire and were therefore considered not viable. This conclusion is also supported by a seed germination study on moistened filter paper that included 60 filled seeds. We observed two seeds or about 3% germination; however, one seed produced only a radicle and the other a radicle and cotyledons. Both seedlings wilted and died without further development. The lack of respiration, low germination rate, and survival of germinated seeds reasonably explains why no seedlings of ‘Bonnie’s Purple Majesty’ were observed within the sunflower plots during the 4-year observation period. Apparently, ‘Bonnie’s Purple Majesty’ and ‘Denita’s Autumn Sunshine’ are incompatible and will not produce viable seeds. Hence, they can be grown together without unintended spread or invasiveness of hybrid plants, in contrast to the case in which a mixed genotype population produced copious seeds and the subsequent appearance of new plants within and outside the original sunflower plot (Trigiano et al. 2021).

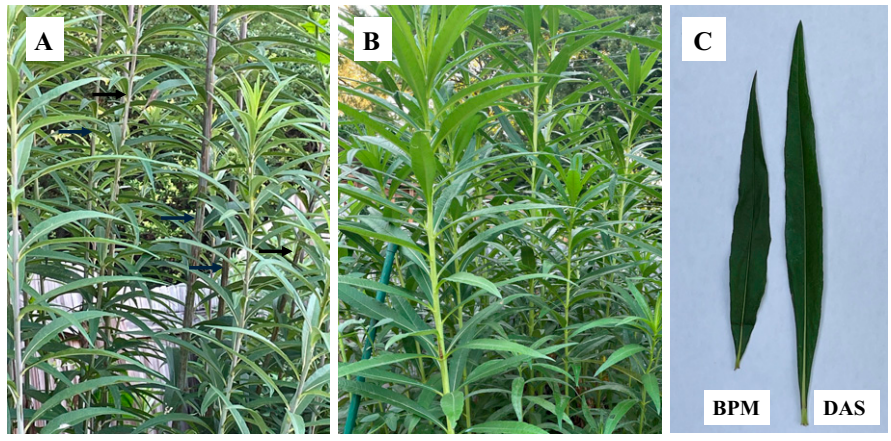

Fig. 1. Comparison of stems and leaves between ‘Bonnie’s Purple Majesty’ (BPM) and ‘Denita’s Autumn Sunshine’ (DAS). (**A**) Various colors of BPM stems including shades of purple (arrows)—see Table 1 for color details. (**B**) Stems of DAS exhibiting uniform green color. (**C**) Comparison of representative BPM and DAS leaves.

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Table 1. Physical comparison of some characteristics of *Helianthus verticillatus* 'Denita's Autumn Sunshine' and 'Bonnie's Purple Majesty'.

Characteristics	Denita's Autumn Sunshine	Bonnie's Purple Majesty
Stems (n = 30)		
Mean height (m)	3.4	2.8
Mean diameter (cm)	2.1	1.7
Colors[i]	Green 150 A or B, but never Purple	Highly Variable: Purple 76 A, N66 D, N78 A–D, N81 A–D, and others including Green 150 A or B
Leaves (n = 30)		
Mean length (cm)	25.5	18.3
Mean width (cm)	2.8	2.1
Color[i]	Green 136 B	Green 136 B
Inflorescences (n = 30)		
Mean number of ray flowers	16	15
Mean length of ray flowers (mm)	25	20
Seeds (n = 30)		
Shape and mean length	Triangular to flat; 3 to 5 mm	Triangular to flat; 3 to 5 mm
Colors[i]	Black 202 A	Grey 201 A–D, Black 202 C, D; Brown N200 C, D

[i] Colors according to the Royal Horticultural Society Colour Chart (2001).

Table 2. Allelic comparisons at nine loci for *Helianthus verticillatus* cultivars Denita's Autumn Sunshine and Bonnie's Purple Majesty.

Locus	Forward and reverse primers 5′–3′	Denita's Autumn Sunshine (bp)	Bonnie's Purple Majesty (bp)
HV012[i]	F: CGAGACGGTTAAGAGCTTGC R: GGTGTACAACCAACTCACACC	335:335	343:343
HV026[i]	F: GAGTCCTGGCCTGAACAGAG R: CAAACTGCAATGTACCTTCTTGAC	293:293	293:293
HV028[i]	F: CTCCCGCACTTCAAGCTAAC R: CATACACCTTTGCGGTTTCC	121:121	121:121
HV037[i]	F: GGTTAGGGTGAGGGTGGTG R: AAGCCATAGTAAGTTCCTCTTACAAAC	160:175	152:160
HV042[i]	F: GGTTACAACGGTGGAAGTCG R: TCCGGTTCACCAATTCATTC	361:361	365:374
HV048[i]	F: TTGTGGAGACGGTGAATGAG R: TCTGCCCGTAGAAACCAAAC	217:217	217:217
eHV002	F: GAACTGATACCGACGCAAACC R: ATTCAGGGTTTCTGCCAGTGG	230:249	249:249
eHV005	F: CAAGTTGTGCCCGATTTGTAGG R: GTCTTCAACTCAAACCACTAGCC	210:229	214:214
eHV033	F: GATCTCTCCATCTCTCGGTGC R: GTGGGTGAAAGGAAAGTGTTGG	127:142	133:133

[i] Published in Pashley et al. (2006) and renamed in Edwards et al. (2020).

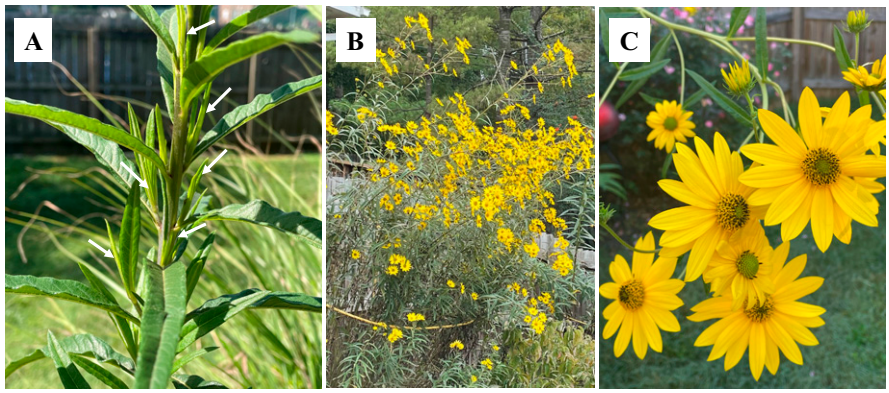

Fig. 2. (**A**) A green stem of 'Bonnie's Purple Majesty' (BPM) exhibiting axillary budbreaks (arrows) in midlate July. These newly formed stems produced inflorescences in August and September. (**B**) Stems of BPM in full bloom in mid-September. (**C**) Typical inflorescences of BPM in midlate September.

'Bonnie's Purple Majesty' with its variable stem color and more diminutive leaves is a good companion cultivar to 'Denita's Autumn Sunshine'. The two perennial cultivars are sexually incompatible and therefore will not establish new hybrid populations via seeds outside the original beds. For additional information and availability contact R. N. Trigiano at rtrigian@utk.edu.

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