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Precision breeding for multiple disease resistance

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In order to broaden TSWV resistance sources for cultivar development, recombinant inbred line F155 from C1931=Tifrunner x SSD 6 population was utilized as the male for crosses with nine elite cultivars and advanced breeding lines (Table 1). F_1 hybrids were planted in the Gibbs farm in 2021 and all of the hybrids demonstrated excellent vigor and minimum TSWV symptoms regardless of the high disease pressure in the field (Figure 1).

Table 1. List of crosses with TSWV resistance line F155 as the male parent.

crossing #	female	Traits with genetic markers	F1 hybrids
C2920	13-1125 = C1805-617-2 x Ga06G	High OL; Resistance to TSWV (A01) and nematode (A09)	11
C2921	13-3532 = C1805-2-9-16 x Bailey Hi O/L	High OL; Resistance to TSWV (A01) and nematode (A09)	9
C2922	CS195 = C2663-2 = C2663 = Ga13M x C2593-F2-34	High OL; Resistance to TSWV (A01) and leafspot (A02, A03)	6
C2923	CS196 = C2663-4 = C2663 = Ga13M x C2593-F2-34	High OL; Resistance to TSWV (A01) and leafspot (A02, A03)	12
C2924	CS 207 = C2682-9= TifNV-High O/L x C2593-F2-293	High OL; Resistance to TSWV (A01) and leafspot (A02, A03)	4
C2925	TifNV-High O/L	High OL; Resistance to TSWV (A01) and nematode (A09)	7
C2926	C724-19-25	High OL; Resistance to TSWV (A01)	6
C2927	GA-18RU	High OL; Resistance to TSWV (A01)	8
C2928	GA-16HO	High OL; Resistance to TSWV (A01)	15

Figure 1. Healthy F1 plot from 13-1125 x F155 (left) in contrast to the F1 plots (right) severely distorted by TSWV disease pressure in the same field at Gibbs farm 2021

Table 2. Yield of F_2 populations from MAGIC four way F_1 hybrids.

Genetic materials	F_1 line #	F_2 seed #	Traits with markers	Source information
(Bailey x C99R)x (NC94022 xYork)	3	126	TSWV A01	MAGIC 4-way F_2s
(NC94022xYork)x(ICG1471xFlorida07)	8	1213	TSWV A01	Harvested from Gibbs
(GP-NCWS17xGeorganic)x(NC94022xYork)	1	70	TSWV A01	farm in 2021
(MarcIxGeorgia12Y)x(NC94022xYork)	8	843	TSWV A01	
(PI323268(CC812)xC431-1-1)x(NC94022xYork)	5	823	TSWV A01	
(CC477xTifNV-HiOL)x(NC94022xYork)	7	1075	TSWV A01; Nematode A09; Hi-O/L	

The F_2 seeds from these crosses will be selected for the presence or absence of the A01 TSWV resistance region in spring 2022 and planted. Field selection of individuals with outstanding agronomical traits will be advanced further and used for crossing with breeding lines possessing leafspot resistance.