A PROPOSAL
TO THE
VARIETY RELEASE COMMITTEE
FOR THE
RELEASE OF A DISEASE RESISTANT PUMPKIN

PREPARED BY

GEORGE BOYHAN
GERARD KREWER
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ATTACHMENT I

APPLICATION FOR APPROVAL OF X CULTIVARS ___ ASSOCIATE CULTIVARS
(Please check appropriate type of application)

1. Crop: Pumpkin (Cucurbita maxima)

2. Experimental no. or name: New Pumpkin

3. Pedigree and history: See attachment

4. Description: A member of the Cucurbitacae family. Large vining plant with unlobed leaves. Monecious sex habit with both male and female flowers produced on the same plant. A bright orange small to medium size fruit is produced at maturity.

5. Station(s) where developed: Vidalia Farm, Coastal Plain Expt. Station, and Attapulgus Research Farm

6. Participating scientist(s): George Boyhan, Gerard Krewer, Darbie Granberry

   Copy of the appropriate and adequate data comparing proposed release to standard cultivar must be attached to this form.

7. In what respect is the new cultivar superior to the cultivar now in use? or reasons for proposing release as an associate cultivar: A high degree of disease resistance particularly to virus diseases. Current varieties are not capable of producing consistently a commercial crop for the fall Halloween market in south Georgia without an ultraintensive spray program due to diseases prevalent during fall production. This is also evident in the yield response of the new variety particularly during fall production.

8. Method of propagation: Seed

9. Amount of breeder seed stocks available (if applicable): 2 lbs.

10. Amount of foundation seed stocks available (if applicable): Approximately 340 lbs. of foundation seed are in storage at the Vidalia Research Laboratory in Tifton.

11. Amount of cutting or bud material available for vegetatively propagated material for nursery distribution (if applicable): NA

12. Is there likely to be unusual difficulty encountered in the production of any class of seed stocks? Explain. No

13. Suggested names for the cultivar: Dixie Orange, Autumn South,Dixie Flame, Gulf Flame, Gulf Autumn, Deepsouth Orange, Dixiween

14. Name approved by Plant Cultivar and Germplasm Release Committee: _____

15. Form of intellectual property protection: Plant Variety Protection

16. Is a royalty assessment recommended: X Yes ___ No

RECOMMENDED BY:

A. _____ Originating Scientist

B. _____ Department Head

C. _____ Chairperson, GAES Plant Cultivar And Germplasm Release Committee

D. _____ Associate Dean for Research

E. _____

F. _____

APPROVED:

_____ Dean and Director College of Agricultural and Environmental Sciences

Pumpkins are an important commodity throughout the United States for the Halloween and Thanksgiving market. Pumpkin production is valued at $71 million from the top producing states of California, Illinois, Michigan, New York, Ohio, and Pennsylvania (USDA, 2004). Most of the pumpkins grown in the U.S. are for the processed pumpkin market, which is centered in Illinois. Halloween pumpkin production on the other hand is scattered throughout the U.S. with most states producing some pumpkins. Pumpkin sales are an important commodity for many pick-your-own (PYO) and direct sales farms in sections of the U.S. where fall pumpkins can be commercially grown for a reasonable price. Growers of PYO pumpkins commonly grow a crop and then "spike" the field by scattering imported pumpkins after the initial crop is sold. Many growers in Georgia have experienced such heavy disease pressure they have not been able to consistently produce pumpkins

Unfortunately, due to high disease pressure during late summer and fall, conventional pumpkins (*Cucurbita pepo*) cannot be produced consistently in south Georgia. Various viruses, powdery mildew, and downy mildew preclude practical production. Only 505 acres were produced in Georgia in 2003 with over 200 of these acres in three northern counties, Dawson, Dade, and Lumpkin Counties (Boatright & McKissick, 2004). Despite this, imported pumpkins are available in retail stores throughout Georgia during the Halloween season of September and October.

In 1996, seed of both oblong and flattened fruit of *C. maxima* were collected from natives in remote areas of South America by Krewer and interplanted in 1997. Putative hybrids from this planting were then planted in 1998 and became the basis for developing a pumpkin variety suitable for production in south Georgia. Continued recurrent phenotypic selection occurred until the winter of 2002-03 at which time selections were grown in the greenhouse and selfed. Two more years of field selection in 2003 and 2004 were made (Figure 1). Seed from superior fruit were bulked as breeder seed in the fall of 2005. Foundation seed production, which produced about 350 lbs. of seed, was done at the Vidalia Farm in the spring of 2005.

Five variety trials comparing selections of this material to commercial pumpkins were conducted in 2003, 2004, and 2005 at two locations, the Vidalia Farm and the Attapulgus Research Center (Tables 1-5). Three of the four new lines trialed in the Fall of 2003 against commercial varieties, Merlin, Gold Strike, and Magic Lantern had significantly higher yields without the severe virus symptoms that develop on commercial lines in south Georgia during this time of year. In addition, a visual evaluation of virus symptoms indicated a significant difference between the new germplasm and standard pumpkins. A second trial in the spring of 2004 when disease pressure was much lower indicated there were no yield differences between these advanced breeding lines and 'Magic Lantern' and 'Gold Strike'. In the third trial in the fall of 2004, neither of the commercial varieties (Gold Strike and Autumn King) survived to produce fruit, while the advanced breeding lines were quite productive. Leave samples of both the advanced breeding lines and conventional pumpkins were sent to Agdia, Inc. for virus testing. The new germplasm was positive for zucchini yellow mosaic virus while the conventional pumpkins were positive for papaya ringspot virus. Although the new material was positive for ZYMV, symptoms never developed beyond a mild

discoloration in the leaves. The plants continued to grow and produce a crop. Conventional pumpkins on the other hand developed severe mosaic and shoestring leaves, stunted plants, and in most cases the eventual death of the plant prior to producing a crop.

In the spring of 2005, a trial was held at the Attapulgus Research Center comparing the new pumpkin (from breeder seed) to seven commercial pumpkin varieties. The new pumpkin yielded significantly more than any of the commercial entries (Table 4). The new pumpkin also had a lower rating for visually rated foliar diseases, but did not differ from other entries for the visual virus rating. In the cucurbit screen conducted by Agdia, Inc. which tests for 11 different viruses and the potyvirus group, none of the samples were positive for any of the tested viruses, however, at least one experimental unit from each entry tested positive for the potyvirus group. The new pumpkin, however, had a significantly lower absorbance value compared to the commercial varieties.

In the fall of 2005 an additional trial was conducted at the Attapulgus Research Center to evaluate the new pumpkin with six commercial varieties. The new pumpkin yielded significantly more than the commercial pumpkins (Table 5). In addition, the new pumpkin had lower foliar diseases as well as virus diseases based on a visual evaluation. Finally, the cucurbit screen (Agdia, Inc.) indicated that at least one experimental unit from each entry was positive for papaya ringspot virus (PRSV) and all experimental units were positive for the potyvirus group. The absorbance values for the new pumpkin were significantly lower than any of the commercial varieties.

Fruit characteristics for this new variety are as would be expected with an open-pollinated variety. There is considerable variability in fruit shape and size. This variety also produces a pronounced ground spot that is not evident with conventional pumpkins. We are not sure why this occurs, but suspect it is light related. The fruit of the new variety is bright yellow when immature and can be picked and handled like summer squash. As it matures it develops a cavity like a conventional pumpkin and it is suitable for carving. In addition, the rind can be processed into pie filling.

A field day held at the Vidalia Onion and Vegetable Research Center in the fall of 2004 introduced growers and other interested parties to these new pumpkins. In addition, presentations about this new variety were given at the Georgia Fruit and Vegetable Grower Association Conference in Savannah (Winter 2005) as well as to county agents in Tifton. There was keen interest expressed at all these venues. Individuals in Wilcox, Irwin, Tattnall, Columbia, Colquitt, Cook, Pulaski, Peach, Emanuel, Bulloch and Screven Counties have indicated an interest in growing these pumpkins. In addition, representatives from Seedway and Siegers Seed Companies have indicated an interest in handling this variety.

Breeder seed ultimately was bulked seed from individual selected fruits. The criteria for selection included shape, color, size, and ability to stand on end. Table 1 is a list of the selected fruit bulked for the breeder seed. This seed was harvested in the fall of 2004 and was increased in the spring of 2005. We have approximately 340 lbs of seed available for the fall 2006 season. Growers in south Georgia are familiar with cucurbit

production with the large acreage of watermelon, cantaloupe, squash, and cucumbers. They should have no trouble adapting to pumpkin production, which has similar cultural requirements of other vining cucurbits. Growers with PYO and direct markets of fruit and vegetable such as strawberries are expected to be major beneficiaries of this new cultivar. Yields of this new pumpkin are expected to be 200-300% greater than the best cultivars now available. This new pumpkin should be well adapted for production throughout the Southeast where pumpkin production has been precluded due to high disease pressure particularly to virus diseases.

Literature Cited

Boatright, S.R. and J.C. McKissick. 2004. 2003 Georgia Farm Gate Vegetable Survey Report. Univ. of Ga. SR 04-01.

USDA. 2004. Vegetable 2003 Summary, January 2004. Publ. Vg 1-2(04).

Table 1. List of individual fruit that were ultimately bulked for breeder seed, fall 2004.

8 T (1)	8 Fert D 1
17 L 5	17 i 2
17 P 1	17 W 1
? 1	17A #1
17A #2	17A #3
6 #2	Orange T #1
Orange T #2	

Release number NP-04-1768

Table 1. Pumpkin variety trial, Vidalia Farm, Fall 2003.

Entry	Source	Yield (lbs/acre)	Yield (No./acre)	Average Fruit Weight (lbs)	Fruit Size Range (lbs)	Disease Rating[z]
Merlin	Harris Moran	3,081	484	6.4	2.5-10.2	4.3
Gold Strike	Rupp	1,416	202	7.0	3.6-12.3	4.0
Magic Lantern	Harris Moran	7,365	1,210	6.1	1.7-12.7	4.0
#12	Experimental	13,544	1,734	7.8	1.4-15.7	2.2
#17	Experimental	24,567	3,630	6.8	2.4-13.9	1.0
#6	Experimental	23,817	4,638	5.1	1.4-16.6	1.6
#8	Experimental	30,278	3,832	7.9	1.8-18.7	1.0
	CV	36%				10%
	Fisher's Protected LSD (p≤0.05)	9,423				1.0

[z]Virus Disease Rating: 1-5, 1-no visible symptoms, 5-severe symptoms.

Table 2. Pumpkin Variety Trial, Vidalia Farm, Spring 2004.

Entry	Source	Yield (lbs/acre)	Yield (No./acre)	Average Fruit Weight (lbs)	Fruit Size Range (lbs)
Magic Lantern	Harris Moran	11,624	1,008	11.5	3.3 - 17.6
Gold Strike	Rupp	11,366	857	13.3	3.4 - 25.9
#6	Experimental	19,368	2,118	9.1	2.6 - 18.8
#1 & #8	Experimental	20,837	2,118	9.8	3.0 - 16.2
#17A & 17B	Experimental	25,286	2,470	10.2	1.4 - 21.8
	CV	51%	52%		
	Fisher's Protected LSD (p≤0.05)	NS	NS		

Table 3. Pumpkin Variety Trial, Vidalia Farm, Fall 2004.

Entry	Source	Yield (lbs/acre)	Yield (No./acre)	Average Fruit Weight (lbs)	Fruit Size Range (lbs)
Gold Strike	Harris Moran	0	0	-	-
Autumn King	Seeds by Design	0	0	-	-
# 6	Experimental	16,121	2,218	7.3	1.4 - 16.2
Orange T	Experimental	13,345	1,739	7.7	1.5 - 15.5
14T	Experimental	16,935	2,319	7.3	1.7 - 18.1
12 & 17A	Experimental	16,930	2,092	8.1	1.4 - 18.0
	CV	57%	51%		
	Fisher's Protected LSD (p=0.05)	11,000	1,293		

Table 4. Pumpkin Variety Trial, Attapulgus Research and Education Center, Spring 2005

Entry	Yield/acre (lbs)	No./acre	Foliar Disease Screen[z]	Virus Screen[z]	Potyvirus ELISA (abs)
New pumpkin	11,598	1,951	2.7	1.0	0.138
Gold Strike	91	22	7.7	1.4	1.284
Longface	46	15	6.2	2.6	0.479
Spooktacular	3,285	1,415	5.7	1.0	1.214
Spirit	78	15	4.2	3.9	2.728
Appalacian	312	44	4.0	2.9	2.516
Phantom	14	8	5.4	4.6	2.376
Trickster	404	232	6.9	2.1	0.187
CV	48%	44%	9%	31%	46%
Fisher's Protected LSD (p=0.05)	410	90	0.4	NS	0.515

[z]Visual disease screening: 1-no visible symptoms, 9-severe disease symptoms.

Table 5. Pumpkin Variety Trial, Attapulgus Research and Education Center, Fall 2005

Entry	Yield/acre (lbs)	No./acre	Foliar Disease Screen[z]	Virus Screen[z]	Potyvirus ELISA (abs)	PRSV ELISA (abs)
New Pumpkin	20,464	4,235	1.9	1.2	1.331	0.140
Longface	0	0	4.1	6.7	3.520	0.709
Spooktacular	771	605	4.6	8.5	4.000	1.279
Spirit	1,053	303	4.5	6.2	4.000	1.332
Appalachian	4,755	726	3.4	3.4	3.579	0.917
Phantom	233	61	5.7	8.2	3.703	1.449
Trickster	166	212	4.7	6.7	3.341	1.376
CV	46%	41%	19%	8%	19%	35%
Fisher's Protected LSD (p=0.05)	2,699	529	0.3	0.1	0.963	0.538

[z]Visual disease screening: 1-no visible symptoms, 9-severe disease symptoms.

Figure 1. New pumpkin variety selection, Vidalia Farm, Lyons, GA September 29, 2004.

Figure 2. Examples of final selections, Fall 2004.

Pedigree for New Pumpkin Cultivar