United States Patent [19]

Craig

[11] **Patent Number: Plant 6,219**

[45] **Date of Patent: Jul. 12, 1988**

[54] **GERANIUM PLANT "PARIS"**

[75] Inventor: **Richard Craig**, State College, Pa.

[73] Assignee: **Research Corporation**, New York, N.Y.

[21] Appl. No.: **882,070**

[22] Filed: **Jul. 3, 1986**

[51] **Int. Cl.**[4] **A01H 5/00**

[52] **U.S. Cl.** **Plt./68**

[58] **Field of Search** Plt./68

Primary Examiner—Robert E. Bagwill

Attorney, Agent, or Firm—Scully, Scott, Murphy & Presser

[57] **ABSTRACT**

This invention relates to a new distinct cultivar of geranium substantially as illustrated and described, characterized as being particularly well adapted to both commercial greenhouse production and garden performance, and possessing unique flavonol and anthocyanin profiles and more fully double flowers when compared to geranium cultivar "Honseler's Glorie Lila".

3 Drawing Sheets

The present invention relates to a new and distinct cultivar of geranium *Pelargonium*×*hortorum* called "Paris". The cultivar is particularly well adapted to both commercial greenhouse production as well as garden performance. The cultivar's novel characteristics include more doubleness in the florets and a distinct flower color when compared to the parent "Honseler's Glorie Lila". The cultivar is further characterized by unique biochemical fingerprint profiles.

The cultivar was developed from an organized, scientifically designed breeding program carried out at the Department of Horticulture, The Pennsylvania State University, University Park, PA 16802 and specifically resulted from selection from the self-pollinated progeny of the geranium cultivar "Honseler's Glorie Lila" (which probably was an asexual selection from "Purpurball"). The cultivar was asexually propagated by cuttings and the reproduction ran true.

DESCRIPTION OF THE FIGURES

FIG. 1 illustrates in color the cultivar including foliage and flowers.

FIG. 2 illustrates the anthocyanin profile obtained from HPLC. Quantitative values are found in the tables. Analyses included a single peak that represented both pelargonidin and petunidin 3,5-diglucosides. Corrections were made in accompanying tables.

Peak No.

1. Delphinidin 3,5-diglucoside
2. Cyanidin 3,5-diglucoside
3. Pelargonidin 3,5-diglucoside
4. Peonidin 3,5-diglucoside
5. Malvidin 3,5-diglucoside

FIG. 3 illustrates the flavonol profile obtained from HPLC. Quantitative values were found in the tables.

Peak No.

1. Quercetin 3-rhamnosylgalactoside
2. Quercetin 3-rutinoside
3. Quercetin 3-galactoside
4. Quercetin 3-glucoside
5. Kaempferol 3-rhamnosylgalactoside
6. Kaempferol 3-galactoside
7. Kaempferol 3-rutinoside

8. Kaempferol 3-glucoside; Kaempferol 7-glucoside; Quercetin 3-rhamnoside
9. Kaempferol 3-xyloside
10. Kaempferol 3-arabinoside
11. Kaempferol 3-rhamnoside

With reference to the detailed description of the cultivar which follows, the test plant was grown in full sun under glass, 60° F. night and 75° F. sunny days. Soilless medium was fertilized constantly with 300 ppm N-K. Color readings were taken under cool white fluorescent lamps at 220 footcandles and color identification was by reference to The Royal Horticultural Society Colour Charts except where common terms of color definition are employed.

The Plant

Clssification:

Botanical.—*Pelargonium*×*hortorum.*

Trade name.—728 (80-208-2)="Paris".

Form: Semi-dwarf; free basal branching; comparatively compact growth; flowers relatively close to foliage; freer flowering; earlier flowering. Major improvement in form for this color range.

Height: 23.0–30.0 cm.

Growth: Faster than standard, leaves smaller than standard; short internodes; free branching from base; no leaf zones.

Strength: Stands upright, without artificial support.

Leaves:

Size.—9.0–15.0 cm.

Shape.—Reniform, variously lobed.

Margin.—Crenate.

Texture.—Pubescent, dull (non-reflective).

Color.—Top: Fan 3, green group, 137-B (R.H.S.C.C.). Bottom: Fan 3, yellow-green group, 146-B (R.H.S.C.C.).

Ribs and veins: Palmate.

Petioles: Fan 3, yellow-green group, 146-D (R.H.S.C.C.).

Stem:

Color.—Same as petioles.

Internodes.—1.5–3.0 cm.

The Bud

Shape: Upright, hemispherical cluster.

Size: 2.0 cm across.

Inflorescence

Blooming habit: Continuous, upright, full double, non-shattering, hemispherical in shape.
Size: 10.0–12.0 cm across.
Borne: Umbel; florets on pedicel; pedicels on peduncle.
Florets:
Form.—Petals irregular, twisted and upright; full double; sepals irregular in number 5–8.
Color.—Top: Fan 2, red-purple group, 67-B (R.H.S.C.C.). Lens: Fan 2, red-purple color group, 66-A(R.H.S.C.C.). Bottom: Veins whitish, Fan 4, white group, 155-B; interveins Fan 2, red-purple group, 65-A (R.H.S.C.C.).
Petal.—18–20 in number (including petaloids) irregular, twisted and upright; full double; reflexed.
Size.—3.0–4.0 cm across.
Texture and appearance.—Irregular surface, reflexed, dull.
Petaloids:
Quantity.—Cannot distinguish from petals.
Shape.—Cannot distinguish from petals.
Color.—Cannot disitnguish from petals.
Pedicel:
Length.—3.0–4.0 cm.
Color.—Fan 3, yellow-green group, 146-D (R.H.S.C.C.).
Peduncle: Arises from node; opposed to leaf petiole.
Length.—16.0–20.0 cm.
Color.—Fan 3, yellow-green group, 146-C (R.H.S.C.C).
Persistence: Persistent, non-shattering.
Disease resistance: Not known.
Lasting quality: Excellent, 3 weeks or longer.

Reproductive Organs

Stamens: 3–4.
Anthers.—Highly sterile; most anthers undeveloped, usually one fertile anther per floret; tan in color.
Filaments.—Twisted, ribbon-like, resembling petaloids about 0.5 cm in length; color nondescript.
Pistils:
Number.—1 pistil, with 4–6 stigmatic lobes.
Length.—1.0 cm.
Stigma.—4- to 6-lobed; purplish, similar to upper petal color.
Style.—1 style; 1.0–2.0 mm long; similar to stigma in color.
Ovaries: 1 ovary; 5.0–6.0 mm; 4- to 6-lobed; green, very pubescent.
Fruit: None observed.

Biochemical Profiles

In recent years, biochemical analysis has played an increasing role in plant systematics and taxonomy. In order to further characterize the cultivar, flavonols and anthocyanins were extracted from the florets and subjected to analysis by high pressure liquid chomatography (HPLC). Background information supporting the validity of the HPLC technique can be found in an article by Asen & Griesbach ("High Pressure Liquid Chromatographic Analysis of Flavonoids in Geranium Florets as an Adjunct for Cultivar Identification", S. Asen and R. Griesbach, *J. Amer. Soc. Hort. Sci.* 108(5):845–850 (1983)), the contents of which are incorporated herein by reference. Briefly, the method for performing the analysis was carried out as follows:

Flavonoid extraction. The sample size for flavonoid identification consisted of the petals from six florets just after anthesis. Three different samples were collected from each cultivar and handled separately for analysis. The petals were weighed, ground in 20 ml of 1% HCl-MeOH with a mortar and pestle, filtered through one layer of Whatman #1 filter paper, and washed with 1% HCl-MeOH. The volume was adjusted to 90 ml and 2–15 ml aliquots were removed for the analysis and handled separately. Each aliquot was taken to dryness at 40° C. in vacuo. All traces of HCl were removed by azeotropic distillation with MeOH. One of the dried extracts was reconstituted in 2 ml of 1% HCl-MeOH and was used for anthocyanin analysis. The other was reconstituted in 2 ml of MeOH and was used for flavonol analysis. Each sample was stored at −34° C. until analyzed.

HPLC. Samples were analyzed on a Waters High Performance Liquid Chromatograph equipped with an automatic injection system (Waters Assoc. Wisp 710A), dual pumps (Waters Assoc. Model 6000A), solvent programmer (Waters Assoc. Model 600), data module (Waters Assoc.), variable wavelength detector (Waters Assoc. Model 480), and a C_{18} column (25 cm×0.46 cm and 5 μm particle size, Supelco).

Most of the flavonol compounds were separated by a linear gradient of 8% to 23% pump B over 55 min (pump A=1% triethylamine buffered to pH 3.0 with H_3PO_4 (TEAP); pump B=CH_3CN) at a flow rate of 1.2 ml/min and a chart speed of 0.5 cm/min. Detection was at 340 nm.

The anthocyanins were resolved by a linear gradient of 30% to 50% pump B over 40 min (pump A=1.5% H_3PO_4; pump B=20% HOAc+25% CH_3CN+55% of 1.5% H_3PO_4) at a flow rate of 1.0 ml/min and a chart speed of 0.5 cm/min. Detection was at 546 nm utilizing a fixed wavelength detector.

The flavonoids were quantified by injecting standards and comparing their peak areas with those from the plant samples. The results are expressed as μg of flavonoid/g fresh weight of plant material.

Results

Chromatographic profiles for anthocyanins and flavonols are presented in FIGS. 2 and 3, respectively; quantification of these profiles by comparison to standards is presented in Tables 1 and 2, respectively.

The anthocyanins petunidin and pelargonidin 3,5-diglucoside were not resolved by the solvent system used. Past research has shown only negligible amounts of petunidin 3,5-diglucside to be present in geranium florets compared to pelargonidin 3,5-diglucoside. In light of this, the peak corresponding to petunidin and pelargonidin 3,5-diglucoside was quantified as pelargonidin 3,5-diglucoside.

Kaempferol 3-rhamnoside could not be quantitated for several cultivars and is designated as ND (not determined). The chromatograms showed a small, wide peak in the region of elution for this compound. If a substantial amount of this compound were present, a distinct peak appeared but minute quantities, if present, were masked.

Other barriers to quantitation of several flavonols existed. Kaempferol 3-glucoside, kaempferol 7-glucoside, and quercetin 3-rhamnoside all had the same retention time under these conditions. If these compounds

are needed to distinguish between cultivars, they would have to be separated by other solvents or column types. Quercetin 3-xyloside appeared in several of the comparisons, but standards were not available to quantify this oompound.

TABLE 1

Anthocyanin concentration in petals of geranium florets

	μg anthocyanidin 3,5-diglucoside/g fresh wt.					
Cultivar	Delphinidin	Cyanidin	Pelargonidin	Peonidin	Malvidin	Total
728	14	23	103	398	591	1129

TABLE 2

Flavonol concentration in petals of geranium florets

	μg/g fresh wt.						
	Qu3-[z]	Qu3-	Qu3-	Qu3-	Km3-	Km3-	Km3-
Cultivar	rhagal	rut	gal	glu	rhagal	gal	rut
728	21	43	t[y]	12	194	29	745

TABLE 2-continued

Flavonol concentration in petals of geranium florets

	μg/g fresh wt.			
Cultivar	Km3-xyl	Km3-arab	Km3-rha	Total
728	13	26	54	1142

[z]Abbreviations: Km = Kaempferol; Qu = Quercetin; arab = arabinoside; gal = galactoside; glu = glucoside; rha = rhamnoside; rhagal = rhamnosylgalactoside; rut = rutinoside; xyl = xyloside.
[y]t = trace < 10 μg.

What is claimed is:

1. A new distinct cultivar of geranium, substantially as illustrated and described, characterized as being particularly well adapted to both commercial greenhouse production and garden performance, and possessing unique flavonol and anthocyanin profiles, more fully double florets and distinct flower color when compared to geranium cultivar "Honseler's Glorie Lila".

* * * * *

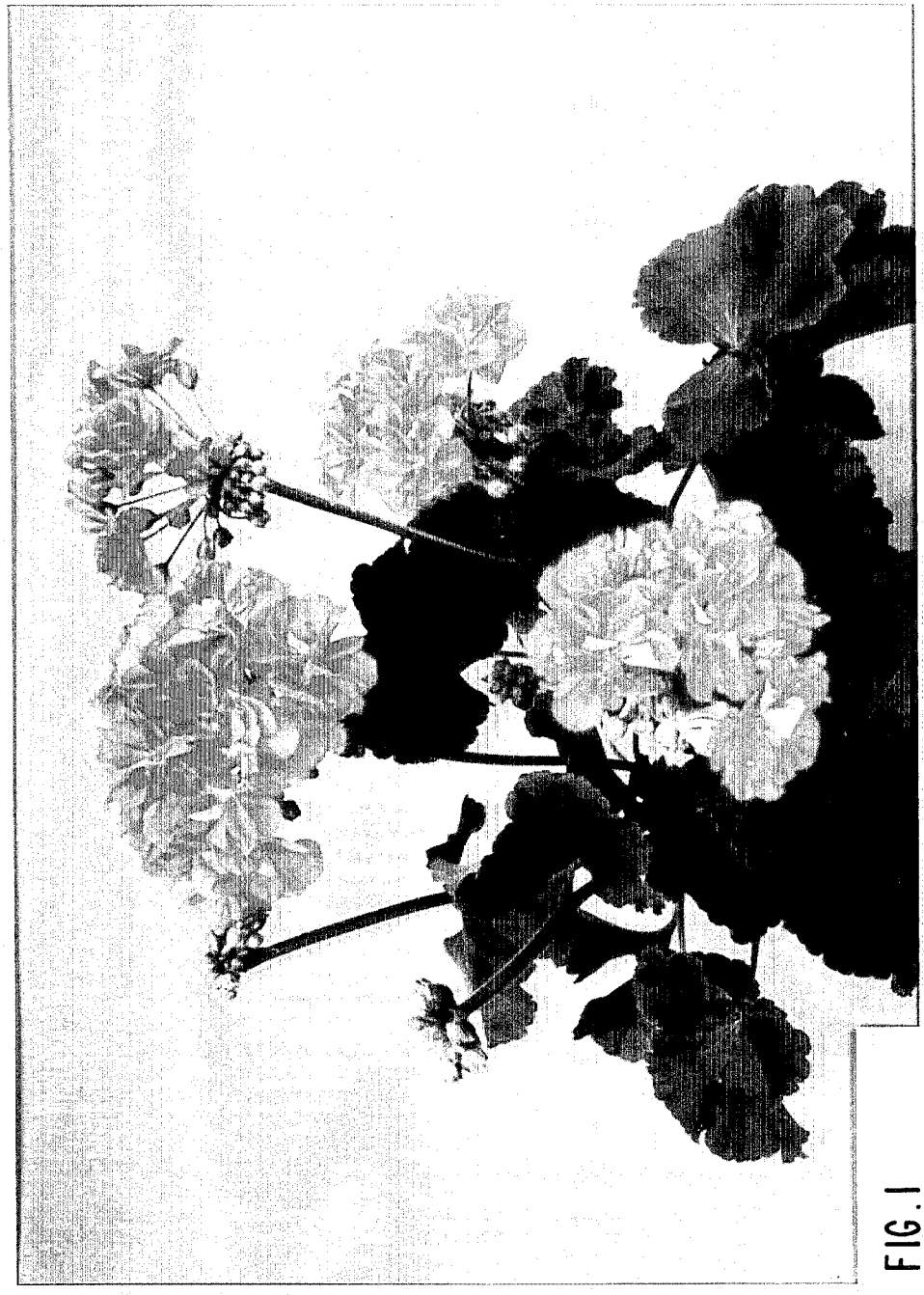

FIG. 1

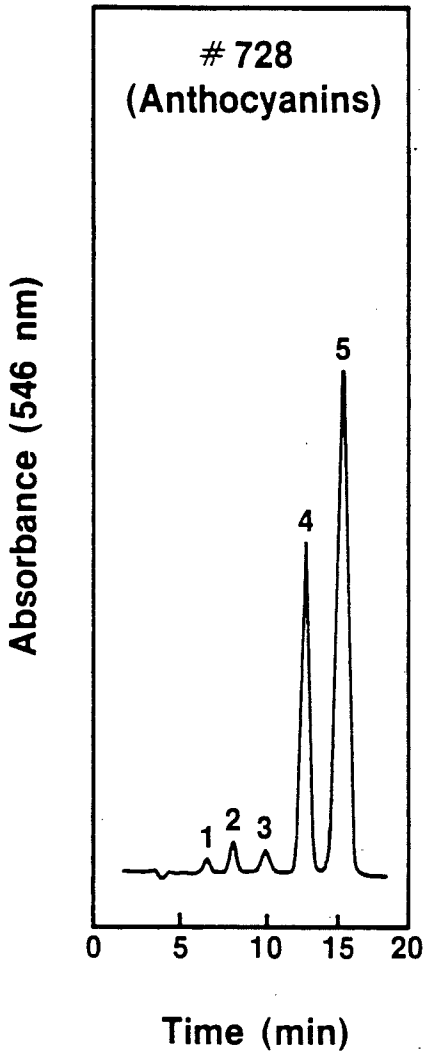
728
(Anthocyanins)
Absorbance (546 nm)
1
2
3
4
5
0
5
10
15
20
Time (min)

FIG. 2

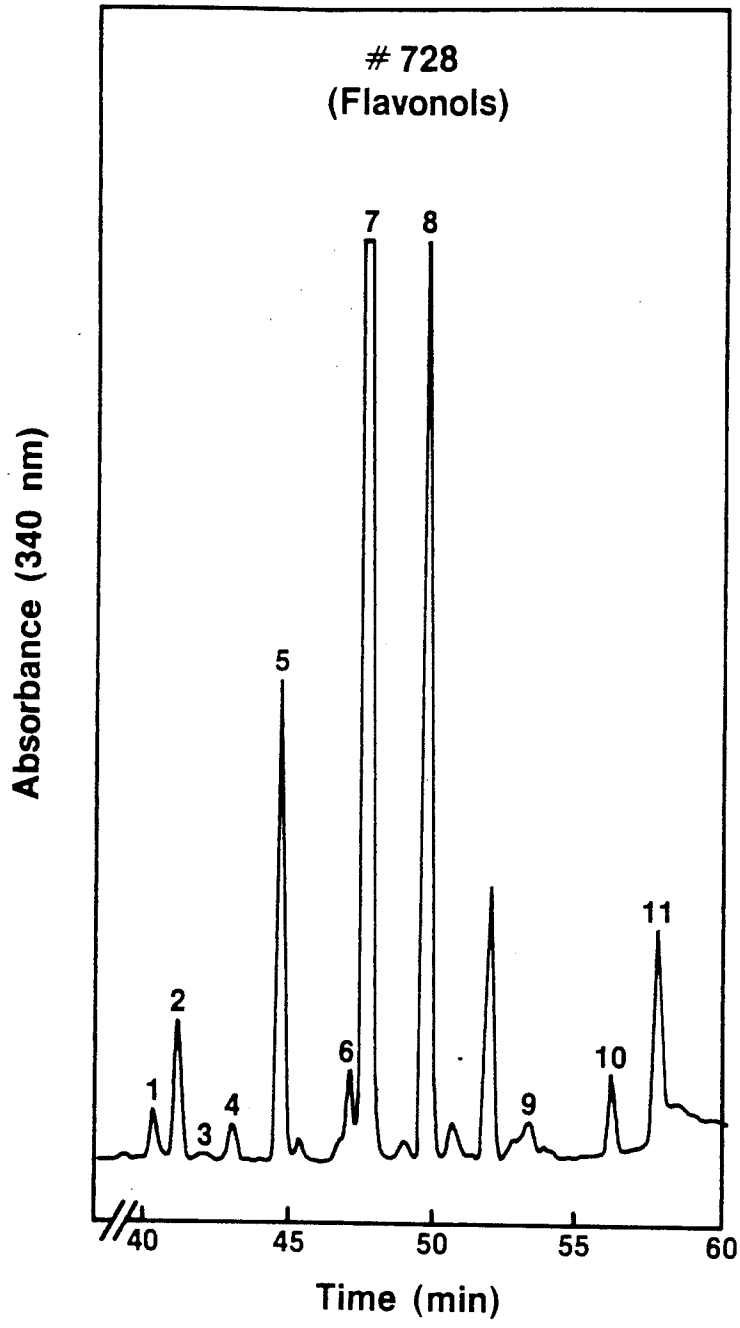
728
(Flavonols)
Absorbance (340 nm)
1
2
3
4
5
6
7
8
9
10
11
40
45
50
55
60
Time (min)

FIG. 3