

US00PP35908P2

(12) **United States Plant Patent**
Knapp et al.

(10) **Patent No.:** **US PP35,908 P2**
(45) **Date of Patent:** **Jul. 2, 2024**

- (54) **STRAWBERRY PLANT NAMED ‘UC GOLDEN GATE’**
- (50) Latin Name: *Fragaria x ananassa Duchesne.*
Varietal Denomination: **UC Golden Gate**
- (71) Applicant: **The Regents of the University of California**, Oakland, CA (US)
- (72) Inventors: **Steven J. Knapp**, Davis, CA (US);
Glenn S. Cole, Davis, CA (US)
- (73) Assignee: **The Regents of the University of California**, Oakland, CA (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
- (21) Appl. No.: **18/135,710**
- (22) Filed: **Apr. 17, 2023**
- (51) **Int. Cl.**
A01H 5/08 (2018.01)
A01H 6/74 (2018.01)
- (52) **U.S. Cl.**
USPC **Plt./209**
CPC *A01H 6/7409* (2018.05)

- (58) **Field of Classification Search**
USPC Plt./209
CPC A01H 6/7409; A01H 5/08
See application file for complete search history.

(56) **References Cited**

PUBLICATIONS

See information in accompanying Information Disclosure Statement letter.
Cal Poly Strawberry Center 2022 Strawberry Field Day, retrieved online at https://content-calpoly-edu.s3.amazonaws.com/strawberry/1/images/2022FieldDayBooklet-FINAL-07_22_22-PM-comp.pdf, 6 introductory pages, pp. 20-29. (Year: 2022).
U.S. Appl. No. 18/135,705, Non-Final Office Action mailed Aug. 29, 2023, 9 pages.

Primary Examiner — Keith O. Robinson

(74) *Attorney, Agent, or Firm* — Kilpatrick Townsend & Stockton LLP

(57) **ABSTRACT**

‘UC Golden Gate’ is a *Fusarium* wilt-resistant day-neutral cultivar of a strawberry plant that produces flavorful, long shelf-life fruit.

2 Drawing Sheets

1

Genus and species: The strawberry plant of this invention is botanically known as *Fragaria x ananassa* Duchesne.

Variety denomination: The variety denomination is ‘UC Golden Gate’.

BACKGROUND

This invention relates to a new and distinct day-neutral strawberry cultivar designated as ‘UCD Golden Gate’. The plant of this selection was originally designated ‘17C139P045’ for initial selection and testing.

BRIEF SUMMARY

‘UCD Golden Gate’ is a *Fusarium* wilt-resistant day-neutral cultivar that originated in the winter of 2017 from a cross between ‘UCD Moxie’ (U.S. Plant Pat. No. 32,953) and proprietary variety 10C017P001. Clones (daughter plants) of ‘UC Golden Gate’ were initially propagated from a single mother plant in 2018. ‘UC Golden Gate’ has since been preserved by annual cycles of asexual propagation from stolons in a facility at Winters, California.

‘UC Golden Gate’ was selected from a full-sib family (17C139) generated from the cross between ‘UCD Moxie’ and ‘10C017P001’. It is not known which is the male parent and which is the female parent. ‘UC Golden Gate’ shares one of the same parents, ‘UCD Moxie’, with ‘UC Keystone’ (U.S. Plant patent application Ser. No. 18/135,708, filed of even date). Seeds of the 17C139 family and the full-sib family 17C138, from which ‘UC Keystone’ originated, were harvested from greenhouse-grown plants in the spring of

2

2017 and germinated in June 2017. Seedlings were transplanted to a greenhouse in July 2017, hardened off in a shade house in August 2017, and transplanted to the field in September 2017. ‘UC Golden Gate’ was one of 10,000 individual hybrid plants from 379 full-sib families that were grown in 2017-18. The population was visually phenotyped in the spring of 2018 to: (a) identify individuals with outstanding fruit size, firmness, symmetry, color, gloss, and visual appeal; (b) eliminate individuals with fruit defects and deformities; (c) estimate marketable fruit yields; (d) identify putative photoperiod insensitive individuals; (e) assess stolon proliferation (runner production) and plant architecture; and (f) select individuals for clonal multiplication and further testing. Ninety-four individuals from the 2017-18 selection cycle were selected for on-farm advanced testing (Phase I, II, and III) in day-neutral production environments, from Nipomo in southern California to Prunedale in northern California. Disease resistance of the selections was tested in Davis, California.

‘UC Golden Gate’ differs from the closest comparison varieties as follows: Parent ‘UCD Moxie’ has a “reduced runnering” phenotype and produces fewer runners than ‘UC Golden Gate’. ‘UC Golden Gate’ has moderate resistance to *Phytophthora* in contrast to parent cultivar 10C017P001, which is susceptible. ‘UC Golden Gate’ also has some tolerance for *Macrophomina*, whereas parent ‘UCD Moxie’ is susceptible. Comparison cultivars ‘Monterey’ (U.S. Plant Pat. No. 19,767), ‘UCD Royal Royce’ (U.S. Plant Pat. No. 32,952) and ‘UCD Valiant’ (U.S. Plant Pat. No. 32,984) are also susceptible to *Fusarium* wilt, in contrast to ‘UC Golden Gate’. ‘UC Golden Gate’ is more compact and has longer

flower trusses than related variety ‘UC Keystone’ and produces more fruit earlier in the season compared to ‘UC Keystone’, which produces more fruit in the late season. ‘UC Golden Gate’ was genotyped with a 50,000-SNP array (Hardigan et. al., *Frontiers in Plant Science* 10:1789, 2020; Hardigan et al., *Mol. Biol. Evol.* 38:2285-2305, 2021) that included 72 cultivars owned by the University of California and 300 publicly available cultivars not owned by the University of California. After quality- and LD-pruning, 31,212 SNP markers with well-separated codominant genotypic clusters were selected for further analysis. These analyses confirmed that ‘UC Golden Gate’ is genetically distinct from its parent varieties, related variety ‘UC Keystone’, and comparison varieties ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’, as well as all of the other cultivars evaluated.

BRIEF DESCRIPTION OF THE DRAWINGS

The colors in the photograph are depicted as nearly true as is reasonably possible to obtain in color reproductions of this type. FIG. 1 depicts fruit characteristics of ‘UC Golden Gate’. FIG. 2 shows 5-month old ‘UC Golden Gate’ plants.

DETAILED DESCRIPTION

Botanical Description

Botanical descriptors of ‘UCD Golden Gate’ are provided in Table 1. The descriptors were collected in the spring and summer of 2022 from plants grown in Santa Maria, California. Plants evaluated in the spring were 6 months old. Plants evaluated in the summer were 8 months old. Colors are designated with reference to The Royal Horticultural Society (R.H.S.) Colour Chart, Sixth Edition, 2015. The characteristics of ‘UC Golden Gate’ may vary in detail, depending upon environmental factors and culture conditions.

TABLE 1

Category	Trait	Unit	Range (Mean ^a) or Color (RHS Colour Designation)
Foliar	Plant height	mm	280-330 (308)
Foliar	Plant spread	mm	500-600 (560)
Foliar	Plant growth habit		Semi-upright
Foliar	Plant, position of the inflorescence in relation to	foliage	Above
Foliar	Mid-tier leaflet length	mm	90-120 (106)
Foliar	Mid-tier leaflet width	mm	120-140 (130)
Foliar	Petiole length	mm	190-240 (216)
Foliar	Stipule core color	color	Strong Yellow Green (144 B)
Foliar	Stipule margin color	color	Strong Yellow Green (144 A)
Foliar	Stolons/nursery mother plant	count	8-10 (9.0)
Foliar	Stolon color	color	Moderate Pink (51 D)
Foliar	Leaf color, adaxial	color	Greyish Olive Green (NN137 A)
Foliar	Leaf color, abaxial	color	Moderate Yellow Green (147 B)
Foliar	Leaf, blistering		Medium
Foliar	Leaf, glossiness		Medium
Foliar	Leaf, shape of base of terminal leaflet		Obtuse

TABLE 1-continued

Category	Trait	Unit	Range (Mean ^a) or Color (RHS Colour Designation)
5	Flower	Arrangement of petals	Overlapping
	Flower	Stamen	Present
	Flower	Petal number	count 5-7 (5)
	Flower	Petal length	mm 12-14 (13)
	Flower	Petal width	mm 12-14 (13)
10	Flower	Calyx diameter	mm 20-35 (29)
	Flower	Calyx, size in relation to corolla	Larger
	Flower	Corolla diameter	mm 25-30 (27)
	Flower	Sepal number	count 10-14 (11)
	Flower	Calyx Color	color Moderate Olive Green (137 A)
15	Flower	Upper Petal Color	color White (NN155 D)
	Flower	Lower Petal Color	color White (NN155 D)
	Flower	Stamen number	count 20-28 (24)
	Fruit	Achene Color	color Greenish Brilliant Yellow (4 A)
20	Fruit	Position of achenes	Below surface
	Fruit	Shape	Conical
	Fruit	Length	mm 40-48 (44)
	Fruit	Width	mm 35-40 (38)
	Fruit	Size of hollow core	mm 2-12 (7)
	Fruit	External Fruit (exterior) (color)	color Moderate Red (N45 A) & Vivid Red (45 A)
25	Fruit	Fruit flesh (color)	color Vivid Reddish Orange (33 A)
	Fruit	Fruit core (color)	color Strong Yellowish Pink (37 A&B) & Moderate Reddish Orange (35 A&B)
30	Fruit	Fruit size	g/fruit 22-32 (27)

^aMean values were estimated from nine samples per trait.

The time of the beginning of flowering is late January, 3 months post-planting.

Marker-Assisted Selection

Marker-assisted selection was employed to identify individuals predicted to be heterozygous or homozygous for the dominant (favorable) alleles for a *Fusarium* wilt resistance locus (FW1) and the PERPETUAL FLOWERING (PF) locus. The genotypes predicted by PF- and FW-linked SNPs for ‘UC Golden Gate’ were PFpf and FW1fw1. The predicted genotypes were confirmed with a 50,000 Aximo SNP array (Hardigan et al, 2020, supra).

Fusarium Wilt Resistance

The dominant FW1 allele confers resistance to *Fusarium* wilt race 1, cause by *Fusarium oxysporum* f.sp. *fragariae*. *Fusarium* resistance was further tested by three years of replicated testing of bare-root plants artificially inoculated with AMP132, a race 1 isolate of the pathogen. The resistance of ‘UC Golden Gate’ to *Fusarium* wilt was compared to that of ‘UC Keystone’, ‘San Andreas’ (U.S. Pat. No. 19,975), which is heterozygous FW1fw1 *Fusarium* wilt-resistant; and to susceptible (homozygous recessive (fw1fw1)) varieties ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’. ‘UC Keystone’, ‘UC Golden Gate’, and ‘San Andreas’ were symptomless in these *Fusarium* wilt screening trials over three years (Table 2) with mean disease scores in the highly resistant range that were not significantly different from one another. The mean disease scores for ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’ were

significantly greater than for ‘UC Golden Gate’ (ordinal scores increase as disease symptoms increase).

‘UC Golden Gate’ resistance to *Verticillium* wilt and *Phytophthora* crown rot (PhCR) was also evaluated (Table 2) in comparison to ‘UC Keystone’, ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’. ‘UC Keystone’ and ‘UC Golden Gate’ are moderately resistant to these diseases. Their resistance phenotypes are not significantly different from ‘San Andreas’ and ‘Monterey’, and other commercially important cultivars.

TABLE 2

Across-year estimated-marginal means (EMMs) ^a for <i>Fusarium</i> wilt, <i>Verticillium</i> wilt, and <i>Phytophthora</i> crown rot (PhCR) resistance scores ^b for ‘UC Keystone’, ‘UC Golden Gate’, ‘UCD Valiant’, ‘UCD Royal Royce’, ‘San Andreas’, and ‘Monterey’ observed in 2019-20, 2020-21, and 2021-22 disease resistance screening trials in Davis, CA.					
Disease ^c	Check Cultivar	Test Cultivar EMM ^d	Check Cultivar EMM	t ^e	p-value ^f
<i>Fusarium</i> Wilt	UCD Valiant	1.17	2.88	-4.02	0.0001
	UCD Royal Royce		2.98	-4.28	0.0001
	San Andreas		1.15	0.04	0.97
	Monterey		3.36	-4.81	<0.0001
	UC Keystone		1.25	-0.19	0.85
<i>Verticillium</i> Wilt	UCD Valiant	1.97	1.93	0.09	0.93
	UCD Royal Royce		2.31	-0.81	0.42
	San Andreas		1.29	0.99	0.33
	Monterey		2.36	-0.77	0.45
	UC Keystone		2.12	-0.34	0.74
<i>Phytophthora</i> Crown Rot	UCD Valiant	2.25	2.25	0.00	1.00
	UCD Royal Royce		2.33	-0.16	0.87
	San Andreas		1.83	0.59	0.56
	Monterey		3.07	-1.23	0.22
	UC Keystone		2.44	-0.34	0.73

^aEMMs were estimated from four replications/entry/year over three years (12 observations/entry), except for *Fusarium*, where additional screening in 2022 resulted in 24 observations/entry.

^bThe ordinal symptom rating scales were identical for each disease: 1 = highly resistant, 2 = moderately resistant, 3 = moderately susceptible, 4 = susceptible, and 5 = highly susceptible.

^cThe fungal pathogens causing these diseases are *Fusarium oxysporum* f. sp. *fragariae* (*Fusarium* wilt), *Verticillium dahliae* (*Verticillium* wilt), *Phytophthora cactorum* (*Phytophthora* crown rot).

^dThe ‘test’ cultivars were ‘UC Keystone’ (shown in the upper half of the table) and ‘UC Golden Gate’ (shown in the lower half of the table).

^et-statistics for linear contrasts (EMM₁-EMM₂) between the EMMs for ‘UC Keystone’ or ‘UC Golden Gate’ and check cultivars.

^fThe probability of a greater t-statistic by chance for tests of the null hypothesis of no difference between EMMs (H₀: EMM₁ = EMM₂).

Photoperiod Insensitive Phenotype

The dominant PF allele is necessary for photoperiod insensitive flowering in cultivated strawberry. The predicted photoperiod insensitive phenotype of ‘UC Golden Gate’ was confirmed through three years of on-farm testing in Santa Maria, California and Prunedale, California. ‘UC Golden Gate’ consistently flowered and fruited throughout the commercial day-neutral growing seasons in Nipomo (35.0N) and Prunedale (36.8N) where daylengths ranged from 9.8 to 14.7 hours.

Field Evaluations

Three seasons of advanced testing of selected day-neutral hybrids originating from the 2017-18 breeding cycle, starting with ninety-four selections in 2018-19 and finishing with six sections in 2021-22, one of which was ‘UC Golden

Gate’, were completed. Comparison cultivars were ‘UC Keystone’, ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’.

Clones (asexually propagated bare-root plants) for the first year of testing (Phase I in 2018-19) were produced in Winters, California. Clones for subsequent years of testing (Phase II in 2019-20 and 2020-21 and Phase III in 2021-22 and 2022-23) were produced in commercial high-elevation nurseries (Dorris, California) using standard production and propagation practices and post-harvest chilling treatments optimized for the day-neutral market segment. Clones were harvested in late October, trimmed, and directly planted in late October and early November of each year.

For on-farm yield trials, plants were grown in two 10-plant plots in Phase I and two 20-plant plots in Phase II, and two 500-1,000-plant strips in Phase III yield trials. The plots were arranged in randomized complete blocks experiment designs in commercial production fields. These experiments were grown using the management practices, bed configurations, plastic mulches, planting densities, planting dates, irrigation, fertilization, and pesticide application decisions and schedules, and harvest schedules of our cooperators.

Marketable fruit yield, count, and size were recorded at each harvest. Collection and analysis of 18,526 observations were employed for these traits to support statistical analyses.

Fruit Quality

Fruit from early and peak season harvests from every trial were performed to phenotype hybrids for firmness, total soluble solids (TSS=Brix), and titratable acidity (TA). The peak and late season fruit from four environments were stored at 4° C. and screened for post-harvest perishability over 14 days. These samples were phenotyped for weight, TSS, TA, firmness, gloss, and leakage at 0, 7, and 14 days post-harvest (DPH). Over three growing seasons, 2,273 phenotypic observations were collected for fruit quality traits at harvest to support statistical analyses and selection decisions.

Plants were assessed for flavor and aroma through informal hedonic testing in the field and laboratory by various individuals, including growers, shippers, and others. Although specific volatile organic compounds (VOCs) known to affect aroma were not selected for, selection pressure for enhanced flavor and aroma was applied and VOC profiles were analyzed for 152 cultivars and other hybrids over two years of on-farm testing. ‘UC Golden Gate’ was among the hybrids phenotyped for VOC. These data were used to assess the effect of subjective olfactory and gustatory assessments on aroma profile changes. VOC analyses were performed using solid phase microextraction (SPME) gas chromatography-mass spectroscopy of fruit samples collected from early and peak season harvests over two years from on-farm yield trials in Santa Maria and Prunedale, California. Although at least 360 VOCs have been identified in developing strawberry receptacles, aroma and flavor are dominated by fewer than 10. Data for approximately 52 VOCs affecting aroma (58,488 phenotypic observations) were collected and analyzed to support statistical analyses. Data for three VOCs (γ-decalactone, mesifurane, and linalool) that are predicted to contribute towards the improved flavor of ‘UC Keystone’ and ‘UC Golden Gate’ are provided.

The fruit quality of ‘UC Golden Gate’ equals or exceeds the fruit quality and shelf life standards of long shelf life (LSL) cultivars designed for prolonged cold storage and long-distance shipping. Table 3 provides a comparison of the cumulative marketable fruit yields and other fruit traits.

TABLE 3

Across-environment estimated marginal means (EMMs) for cumulative marketable fruit yield and other fruit traits for ‘UC Golden Gate’ and comparison cultivars grown on commercial farms in Nipomo and Prunedale, CA over three growing seasons (2019-20 to 2021-22) ^a .					
Trait ^a	Comparison Cultivar	UC Golden Gate EMM	Comparison Cultivar EMM	t ^b	p-value ^c
Yield (lb/acre)	Monterey	95,730	88,323	0.68	0.50
	UCD Valiant		91,783	0.36	0.72
	UCD Royal		89,044	0.61	0.54
	Royce				
Size (g/fruit)	UC Keystone	28.7	103,710	-0.73	0.47
	Monterey		29.7	-1.88	0.06
	UCD Valiant		33.0	-7.41	<0.0001
	UCD Royal		28.8	-0.18	0.85
Firmness (g-force)	Royce	303.7			
	UC Keystone		28.0	1.20	0.23
	Monterey		239.1	4.79	<0.0001
	UCD Valiant		297.1	0.46	0.65
TSS (%)	UCD Royal	7.84	349.9	-3.22	0.002
	Royce				
	UC Keystone		260.6	3.25	0.002
	Monterey		8.89	-5.92	<0.0001
TA (%)	UCD Valiant	0.85	7.37	2.55	0.01
	UCD Royal		7.57	1.49	0.14
	Royce				
	UC Keystone		8.29	-2.59	0.01
TSS/TA	Monterey	9.45	0.76	3.73	0.0005
	UCD Valiant		0.82	1.37	0.18
	UCD Royal		0.82	1.46	0.15
	Royce				
	UC Keystone		0.77	4.21	0.0001
	Monterey		10.44	-7.505	<0.0001
	UCD Valiant		9.20	0.79	0.43
	UCD Royal		9.55	-0.34	0.73
	Royce				
	UC Keystone		11.01	-5.19	<0.0001

^aCumulative marketable fruit yields were estimated from fruit harvested on commercial schedules (once or twice weekly) over the entire day-neutral growing season on each farm. Fruit firmness, total soluble solids (TSS), and titratable acidity (TA) were measured from multiple fruit/replication sampled from two harvests/trial. EMMs and test statistics were estimated from the phenotypes of fruit harvested from two 24-plantplots/entry/environment.

^bt-statistics for linear contrasts (EMM₁ – EMM₂) between ‘UC Golden Gate’ and check cultivar EMMs.

^cThe probability of a greater t-statistic by chance for tests of the null hypothesis of no difference between EMMs (H₀: EMM₁ = EMM₂).

‘UC Keystone’ and ‘UC Golden Gate’ produced large fruit (28.0 to 28.7 g/fruit) in the on-farm trials (Table 3). Their fruit weights were in the normal range for mass-produced day-neutral cultivars in California.

‘UC Golden Gate’ fruit were significantly firmer (303.7 g-force) than ‘UC Keystone’ (260.6 g-force; p=0.0002) and ‘Monterey’ (239.1 g-force; p<0.0001). The firmness of these cultivars exceeded the threshold (>230 g-force) necessary for minimizing harvest and post-harvest losses and delivering a high quality product to markets over long distances.

The sweetness and sourness profiles of ‘UC Keystone’ and ‘UC Golden Gate’ are slightly different. Total soluble solids (TSS) were slightly greater for ‘UC Keystone’ (8.33) than ‘UC Golden Gate’ (7.85; p=0.008), whereas titratable acidity (TA) was greater for ‘UC Golden Gate’ (0.83) than ‘UC Keystone’ (0.74; p=0.0003). The TSS/TA ratio (a measure of perceived sweetness) was significantly greater

for ‘UC Keystone’ (11.66) than ‘UC Golden Gate’ (9.86; p=0.0001). The TSS/TA ratio for ‘UC Keystone’ was slightly lower but not significantly different from ‘Monterey’, whereas the TSS/TA ratio for ‘UC Golden Gate’ was significantly lower than ‘Monterey’ (p<0.0001). Hence, the sweetness and perceived sweetness ratings for ‘UC Keystone’ and ‘Monterey’ were essentially identical and greater than ‘UC Golden Gate’. The slightly sweeter qualities of ‘UC Keystone’ and slightly tarter qualities of ‘UC Golden Gate’ have both been well received by growers and taste testers. The flavor improvements of ‘UC Keystone’ and ‘UC Golden Gate’ over ‘UCD Royal Royce’ and ‘UCD Valiant’ were partly driven by increased TSS and TSS/TA ratios; however, as previously noted, ‘UC Golden Gate’ falls near those cultivars and below ‘Monterey’ in sweetness and TSS/TA ratio.

‘UC Keystone’ and ‘UC Golden Gate’ were identified to have improved aroma from subjective olfactory and gustatory assessments of fruit. Solid phase microextraction (SPME) GC-MS analyses of volatile organic compounds (Table 4) suggested that part of the improved flavor of ‘UC Keystone’ and ‘UC Golden Gate’ can be attributed to an increase in γ -decalactone (5-hexyloxolan-2-one), the most abundant lactone found in strawberry. This VOC, which imparts an intense-peach flavor, is abundant in ‘Albion’ (U.S. Plant Pat. No. 16,228) and absent in ‘Monterey’.

TABLE 4

Across-year estimated-marginal means (EMMs) ^a for γ -decalactone, mesifurane, and linalool concentrations ^a in ripe fruit of ‘UC Keystone’, ‘UC Golden Gate’, and comparison cultivars harvested in 2020-21 and 2021-22 from on-farm yield trials in Nipomo, CA.			
Cultivar	γ -decalactone EMM	mesifurane EMM	linalool EMM
Monterey	0	1,025,275	58,682
UCD Royal Royce	7,253	247,148	0
UCD Valiant	14,406	213,015	1,374
UC Keystone	34,740	156,584	20,783
UC Golden Gate	7,273	241,300	6,265
Albion	132,592	991,288	17,942
LSD ^b	109,763	146,678	26,860

^aEMMs were estimated from fruit sampled from two 20- or 40-plant plots/entry/year. The relative concentrations of volatile organic compounds (ng/g dry weight) were estimated from the raw solid phase microextraction (SPME) GC-MS data (peak area in counts) and normalized samples.

^bLeast significant differences are shown for a false-positive probability of p = 0.05.

‘UC Keystone’ and ‘UC Golden Gate’ meet or exceed the shelf life requirements for mass-produced cultivars developed for cold storage and long distance shipping in California. Minimal declines were observed in the deterioration of fruit firmness and other fruit quality traits over 14 days of post-harvest cold storage using fruit sampled from peak and late season harvests. No statistically significant differences for fruit weight, TSS, TA, or leakage between ‘UC Keystone’ and ‘UC Golden Gate’ and comparison cultivars were observed.

Fruit Production Characteristics—Field Trials

The number of harvests ranged from 40 to 61 in each trial to assess ‘UC Golden Gate’ fruit production in comparison to that of ‘UC Keystone’, ‘Monterey’, ‘UCD Royal Royce’, and ‘UCD Valiant’. Marketable fruit yield, count, and size were recorded at each harvest. Collection and analysis of 18,526 observations was performed for these traits to support statistical analyses.

Statistics are shown for linear contrasts between the estimated marginal means (EMMs) for ‘UC Keystone’, ‘UC Golden Gate’, and comparison cultivars across environment (2 locations 3 years) and for individual environments to highlight variation in planting dates, the number of harvests, harvest ranges, and production practices (Table 5). EMMs were estimated from two 20-plant plots (replications)/entry/environment in 2020 and 2021 and two 40-plant plots in 2022.

TABLE 5

Within environment estimated marginal means (EMMs) for cumulative marketable fruit yield for ‘UC Golden Gate’ and check cultivars grown on farms in coastal California over three growing seasons (2019-20 to 2021-22) ^a .				
Location	Season	Comparison Cultivar	UC Golden Gate EMM (lb/a)	Compare Cultivar EMM (lb/a)
Nipomo	2019-20	Monterey	82,971	64,797
		UCD Royal Royce		79,625
		UCD Valiant		90,853
		UC Keystone		88,028
Prunedale	219-020	Monterey	103,065	73,300
		UCD Royal Royce		101,146
		UCD Valiant		81,841
		UC Keystone		103,149
Nipomo	2020-21	Monterey	99,935	70,682
		UCD Royal Royce		93,142
		UCD Valiant		107,279
		UC Keystone		99,214
Prunedale	202-021	Monterey	123,669	97,546
		UCD Royal Royce		128,842
		UCD Valiant		119,684
		UC Keystone		115,908
Nipomo	2021-22	Monterey	59,740	69,976
		UCD Royal Royce		39,241
		UCD Valiant		57,602
		UC Keystone		56,691
Prunedale	2021-22	Monterey	104,999	152,127
		UCD Royal Royce		92,924
		UCD Valiant		93,437
		UC Keystone		158,914
Location		Yield Change (%) ^b	t ^c	p-value ^d
Nipomo		28.0	2.89	0.02
		4.2	0.41	0.69
		−8.7	−1.26	0.24
		−5.7	−0.84	0.42
Prunedale		40.6	5.55	0.0002
		1.9	0.36	0.73
		25.9	3.96	0.002
		−0.1	−0.02	0.99
Nipomo		41.4	3.24	0.01
		7.3	0.75	0.47
		−6.8	−0.81	0.44
		0.7	0.08	0.94
Prunedale		26.8	4.15	0.002
		−4.0	−0.82	0.43
		3.3	0.63	0.54
		6.7	1.23	0.24

TABLE 5-continued

Within environment estimated marginal means (EMMs) for cumulative marketable fruit yield for ‘UC Golden Gate’ and check cultivars grown on farms in coastal California over three growing seasons (2019-20 to 2021-22) ^a .			
Nipomo	-14.6	-3.25	0.004
	52.2	5.64	<0.0001
	3.7	0.59	0.56
	5.4	0.97	0.34
Prunedale	-31.0	-7.06	<0.0001
	13.0	1.57	0.13
	12.4	1.50	0.15
	-33.9	-8.08	<0.0001

^aLinear contrasts between estimated marginal means (EMMs) for ‘UC Golden Gate’ and comparison cultivars were estimated for each environment. EMMs were estimated from two 20- or 40-plant plots/entry within each environment. Cumulative marketable fruit yields were estimated from fruit harvested on commercial schedules (once or twice weekly) over the entire day-neutral growing season on each farm.

^bThe yield change percentage was estimated by $(EMM_1 - EMM_2)/EMM_2 \times 100$.

^ct-statistics for linear contrasts $(EMM_1 - EMM_2)$ between the EMMs for ‘UC Golden Gate’ and comparison cultivars.

^dThe probability of a greater t-statistic by chance for tests of the null hypothesis of no difference between EMMs ($H_0: EMM_1 = EMM_2$).

‘UC Keystone’ and ‘UC Golden Gate’ were the highest yielding cultivars in these trials. When averaged across environments, however, the yields of ‘UC Keystone’, ‘UC Golden Gate’, and the three comparison cultivars were not statistically different. Thus, ‘UC Golden Gate’ has yields at least equal to the *Fusarium* wilt-susceptible comparison cultivars.

The cumulative marketable fruit yields of ‘UC Golden Gate’ were 18,174 to 29,765 lb/a greater than ‘Monterey’ in four environments and 10,236 to 47,915 lb/a less than ‘Monterey’ in two environments (Table 5).

The cumulative marketable yield plots for each environment highlight the differences among cultivars and growing seasons. The yields of ‘Monterey’ were below and separated from ‘UC Keystone’, ‘UC Golden Gate’, and the other comparison cultivars in the first two growing seasons. Yields dropped in the last growing season (2021-22) in Nipomo especially compared to previous years, with less separation among cultivars.

The cumulative marketable fruit yields of ‘UC Keystone’ and ‘UC Golden Gate’ were not significantly different in five of six test environments or across environments (Tables 3 and 5). The yield of ‘UC Keystone’ was significantly greater than ‘UC Golden Gate’ in one environment (Prunedale 2021-2022). The reasons for yield decreases for ‘UC Golden Gate’, ‘UCD Royal Royce’, and ‘UCD Valiant’ in the 2021-22 Prunedale trial were not clear. The affected plants ultimately recovered, however, and produced an abundance of fruit later in the season.

‘UC Golden Gate’ is thus a highly productive *Fusarium* wilt resistant cultivar for the day-neutral segment that meets or exceeds the shelf life, flavor, and fruit quality characteristics of ‘Monterey’.

What is claimed is:

1. A new and distinct cultivar of strawberry plant named ‘UC Golden Gate’, substantially as described and illustrated herein.

* * * * *

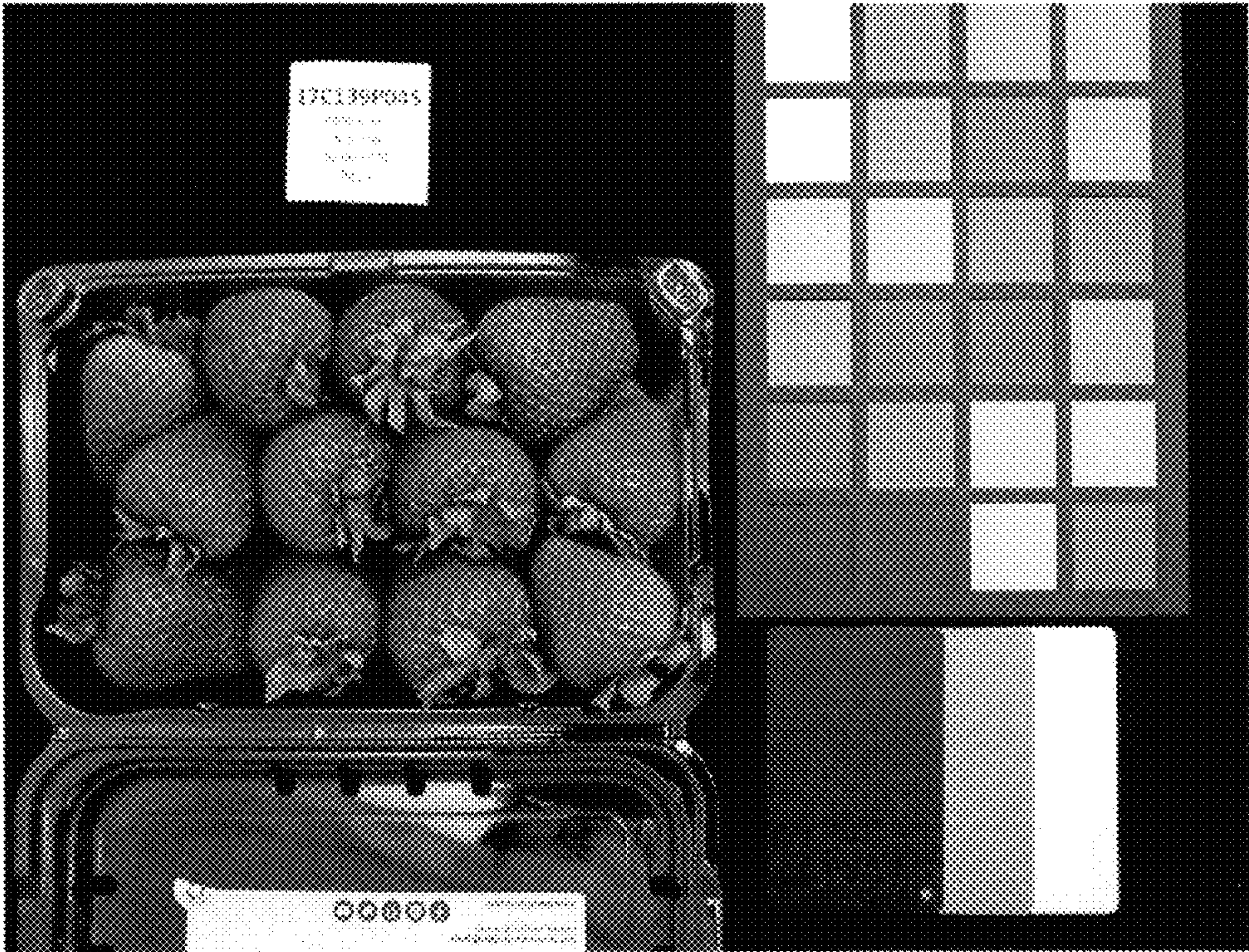


FIG. 1



FIG. 2