No. 9400033

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Arizona Plant Breeders, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED, PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'Kronos'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-eighth day of June in the year of our Lord one thousand nine hundred and ninety-six.

Attest:

Marsha A. Stanton
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Dan Glickman
Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and edition date on all reproductions.* OMB APPROVED NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(INSTRUCTIONS ON REVERSE)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate): Arizona Plant Breeders, Inc.
2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.: DO3-21
3. VARIETY NAME: Kronos
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP): P.O. Box 5985, Arizona City, AZ 85223
5. PHONE (include area code): (602) 466-5917

FOR OFFICIAL USE ONLY

PVPO NUMBER: 9400033

FILING — Date: December 1, 1993; Time: 10:45 ☒ A.M. ☐ P.M.

FEES RECEIVED — Filing and Examination Fee: $ 2325.00; Date: December 1, 1993; Certificate Fee: $ 300.00; Date: 3-5-96

6. GENUS AND SPECIES NAME: Triticum durum
7. FAMILY NAME *(Botanical)*: Graminea
8. CROP KIND NAME *(Common Name)*: wheat durum
9. DATE OF DETERMINATION: 3/1/91
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.): Corporation
11. IF INCORPORATED, GIVE STATE OF INCORPORATION: Montana
12. DATE OF INCORPORATION: 1/18/89
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS:
Albert E. Carleton
P.O. Box 5985
Arizona City, AZ 85223
PHONE (include area code): (602) 466-5917

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow* **INSTRUCTIONS** *on reverse)*
- a. ☒ Exhibit A, Origin and Breeding History of the Variety
- b. ☒ Exhibit B, Novelty Statement
- c. ☒ Exhibit C, Objective Description of Variety
- d. ☐ Exhibit D, Additional Description of Variety
- e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership
- f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office 11/29/1993
- g. ☒ Filing and Examination Fee ($2,325) made payable to "Treasurer of the United States"

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See section 83(a) of the Plant Variety Protection Act)* ☒ YES *(If "YES," answer items 16 and 17 below)* ☐ NO *(If "NO," skip to item 18 below)*

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? ☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? ☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
☐ YES (If "YES," through ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____).
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☒ YES (If "YES," GIVE NAMES OF COUNTRIES AND DATES) U.S.A., Dec. 92 through Feb. 93
☐ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT [Owner(s)]	CAPACITY OR TITLE	DATE
Albert E Carleton	President	11/29/93
SIGNATURE OF APPLICANT [Owner(s)]	CAPACITY OR TITLE	DATE

SD-470 (06-93) *Editions of Forms LS-470 (3/86) and CSSD-470 (5/89) are to be destroyed.*

CONTINUED ON REVERSE

Kronos Durum

14.a Exhibit A, Origin and Breeding History of Kronos Durum.

Kronos was derived by Arizona Plant Breeders, Inc. from a F_2 head selection made in a genetic male sterile facilitated recurrent selection population. This population was develop by the University of Arizona and released as AZ-MSFRS-86 Quality Enhanced Spring Durum Wheat Germplasm.

The F_2 population of this germplasm was grown in Arizona in the fall of 1987 and a single head was selected in the spring of 1988 to be grown as an F_3 head-row in Montana. Four heads were selected from this F_3 row and seeded in Arizona as an F_4 plot of four single rows in the fall of 1988. Twenty-four (24) heads were taken from one F_4 row within the plot and seeded in Montana in the spring of 1989. Eighteen (18) uniform, non-segregating F_5 rows were bulked to form the F_6 generation. This F_6 generation was used for testing and a bulk increase to the F_7 generation in Arizona during the fall of 1989. The bulk F_7 seed was used to plant a small increase during the summer of 1990 in Montana. The F_8 seed harvested from Montana was designated basic seed and was used to produce breeders seed during the winter of 1990 in Arizona.

Kronos has a tall variant that occurs at the frequency of 1 in 20,000 plants and a black awned variant that occurs at a frequency of 1 in 20,000 plants. Male sterility may also occur at a frequency of 1 in 50,000 plants.

Kronos is a stable and uniform variety in agronomic appearance and performance across several generations and environments. Agronomic and quality data to support stability is presented in Tables I.a. through c. for yield and agronomic characteristics; and Tables II.a. and b. for quality data.

Kronos Durum

14.b. Exhibit B, Novelty Statement.

Kronos is a spring durum wheat, early in maturity, with short, strong and white straw. Kronos is most similar in phenotypic appearance to the variety WestBred 881 and WestBred Turbo. Kronos is one to two days earlier than WB 881 and about 14 days earlier than WB Turbo in heading date. Kronos is 2 to 4 cm. taller than WB 881 and about 6 cm. shorter than WB Turbo. Kronos has white heads and awns like WB 881 but different than WB Turbo that has black awns and white heads. Kronos has larger heads than WB 881 but smaller heads than WB Turbo. The above comparisons along with the completed objective description (14.c. Exhibit C) show Kronos to be a novel variety of spring durum

14.e. Exhibit E, Statement of the Basis of Applicant's Ownership.

The variety for which Plant Variety Protection is hereby sought was developed by Dr. Albert E. Carleton, an employee and major stockholder of Arizona Plant Breeders, Inc.("APB"). By agreement between the employee and APB all rights to any invention, discovery or development made by the employee while employed by APB were assigned to APB with no rights of any kind retained by the employee.

FORM APPROVED: OMB NO. 0581-0056

EXHIBIT C
(Wheat)

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
COMMODITIES SCIENTIFIC SUPPORT DIVISION
BELTSVILLE, MARYLAND 20705

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*TRITICUM SPP.*)

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S)
Arizona Plant Breeders, Inc.

ADDRESS (*Street and No. or R.F.D. No., City, State, and ZIP Code*)
P.O. Box 5985
Arizona City, AZ 85223

FOR OFFICIAL USE ONLY

PVPO NUMBER: 9400033

VARIETY NAME OR TEMPORARY DESIGNATION: Kronos

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. KIND:
[2] 1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:
[1] 1 = SPRING 2 = WINTER 3 = OTHER (*Specify*) ____
[2] 1 = SOFT 2 = HARD 3 = OTHER (*Specify*) ____
[3] 1 = WHITE 2 = RED 3 = OTHER (*Specify*) amber

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:
[0][9][0] FIRST FLOWERING
[1][0][2] LAST FLOWERING

4. MATURITY (*50% Flowering*):
[1][2] NO. OF DAYS *EARLIER* THAN .....
[–][–] NO. OF DAYS *LATER* THAN .....
[6] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS
[–]

5. PLANT HEIGHT (*From soil level to top of head*):
[0][8][8] CM. HIGH
[–][–] CM. TALLER THAN .....
[–]
[3][3] CM. SHORTER THAN .....
[6] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (*See reverse*):
[2] 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHER COLOR:
[1] 1 = YELLOW 2 = PURPLE

8. STEM:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom: 1 = ABSENT 2 = PRESENT
[1] Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT
[1] Internodes: 1 = HOLLOW 2 = SOLID
[0][4] NO. OF NODES (*Originating from node above ground*)
[1][9] CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[1] Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:
[1] Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER (*Specify*): ____
[2] Flag leaf: 1 = NOT TWISTED 2 = TWISTED
[1] Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT
[2][0] MM. LEAF WIDTH (*First leaf below flag leaf*)
[3][2] CM. LEAF LENGTH (*First leaf below flag leaf*):

FORM LMGS 470-6 (6-82) (Formerly Form LPGS 470-6 (3-79), which may be used)

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11. HEAD:

[2] Density: 1 = LAX 2 = DENSE

[2] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER (Specify) _____

[4] Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

[1] Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED 5 = BROWN 6 = BLACK 7 = OTHER (Specify): _____

[0 9] CM. LENGTH [1 8] MM. WIDTH

12. GLUMES AT MATURITY:

[3] Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.) 3 = LONG (CA. 9 mm.)

[3] Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.) 3 = WIDE (CA. 4 mm.)

[4] Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED 4 = SQUARE 5 = ELEVATED 6 = APICULATE

[3] Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

[1] 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

[1] 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

[1] 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

[3] Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

[1] Cheek: 1 = ROUNDED 2 = ANGULAR

[1] Brush: 1 = SHORT 2 = MEDIUM 3 = LONG

[1] Brush: 1 = NOT COLLARED 2 = COLLARED

[0] Phenol reaction (See instructions): 1 = IVORY 2 = FAWN 3 = LT. BROWN 4 = BROWN 5 = BLACK 0 = Unchecked

[2] Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify) _____

[0 9] MM. LENGTH [0 3] MM. WIDTH [5 5] GM. PER 1000 SEEDS

17. SEED CREASE:

[1] Width: 1 = 60% OR LESS OF KERNEL 'WINOKA' 2 = 80% OR LESS OF KERNEL 'CHRIS' 3 = NEARLY AS WIDE AS KERNEL 'LEMHI'

[1] Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT' 2 = 35% OR LESS OF KERNEL 'CHRIS' 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] STEM RUST (Races) _____ [0] LEAF RUST (Races) _____ [0] STRIPE RUST (Races) _____ [0] LOOSE SMUT

[2] POWDERY MILDEW [0] BUNT [0] OTHER (Specify) _____

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19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] SAWFLY [0] APHID (Bydv.) [0] GREEN BUG [0] CEREAL LEAF BEETLE

[0] OTHER (Specify) _____ HESSIAN FLY RACES: [0] GP [0] A [0] B [0] C [0] D [0] E [0] F [0] G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	WB Turbo	Seed size	WB 881
Leaf size	WB Turbo	Seed shape	WB 881
Leaf color	WB 881	Coleoptile elongation	WB 881
Leaf carriage	WB 881	Seedling pigmentation	WB 881

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

(a) L.W. Briggle and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.

(b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. (See attachment.)

TABLE 28. 1994 AND 1992-94 DURUM WHEAT YIELD SUMMARY (LB/ACRE).

ENTRY	UC DAVIS 1994 1 LOC/YR	UC DAVIS 1993-94 2 LOC/YR	UC DAVIS 1992-94 3 LOC/YR	KINGS 1994 1 LOC/YR	KINGS 1993-94 2 LOC/YR	KINGS 1992-94 3 LOC/YR	IMPERIAL 1994 1 LOC/YR	IMPERIAL 1993-94 2 LOC/YR	IMPERIAL 1992-94 3 LOC/YR
112 YECORA ROJO	6450 (36)	5760 (20)		5690 (26)	6170 (11)		7290 (37)	7660 (21)	
169 MEXICALI 75	6630 (33)	6360 (16)	6360 (15)	5320 (34)	5490 (20)	5520 (13)	7940 (32)	8090 (20)	8090 (15)
496 YAVAROS 79	8030 (06)	7560 (06)	7490 (05)	6230 (08)	6280 (08)	5800 (09)	10350 (01)	10290 (01)	9710 (02)
522 WESTBRED 881	7080 (22)	6440 (14)	6640 (13)	5880 (19)	5530 (19)	5550 (12)	8080 (27)	8630 (13)	8370 (12)
674 WESTBRED TURBO	8800 (01)	8520 (01)	8150 (01)	6630 (02)	6380 (06)	5940 (06)	10190 (02)	10280 (02)	9950 (01)
798 REVA	7340 (16)	7280 (09)	7320 (07)	5420 (33)	5870 (16)	5230 (15)	7970 (31)	8600 (14)	8610 (10)
809 DUREX	6990 (25)	6280 (17)	6280 (16)	5760 (22)	5340 (21)	5010 (16)	7690 (36)	8360 (17)	8230 (13)
878 DURAKING	7890 (08)	7790 (03)	7480 (06)	5670 (27)	6470 (05)	6430 (02)	9290 (06)	9670 (03)	9010 (03)
907 UC 907	6750 (29)	6380 (15)	6750 (12)	5670 (28)	6210 (09)	6070 (05)	9090 (09)	9010 (07)	8990 (04)
908 UC 908	6670 (31)	6590 (13)	7020 (09)	5570 (31)	6490 (04)	6210 (03)	8900 (12)	8980 (08)	8940 (05)
910 UC 910	6040 (37)	6030 (18)	6440 (14)	5530 (32)	6050 (13)	5900 (07)	8280 (21)	8490 (15)	8500 (11)
915 FMC 8869	7470 (14)	7640 (05)	7560 (04)	5900 (17)	6160 (12)	5860 (08)	8430 (19)	9090 (06)	8840 (06)
944 CORTEZ	8410 (03)	8110 (02)	7990 (02)	6330 (07)	6950 (01)	6770 (01)	9420 (05)	9210 (05)	8680 (08)
947 KOFA	7330 (17)	6590 (12)	6850 (11)	5980 (12)	5910 (15)	5570 (11)	8190 (26)	8490 (16)	8200 (14)
951 KRONOS	7700 (10)	7550 (07)	7720 (03)	5920 (15)	6350 (07)	5750 (10)	8340 (20)	8880 (09)	8840 (06)
952 MINOS	7000 (24)	6900 (10)	7200 (08)	5900 (18)	6190 (10)	6200 (04)	8040 (28)	8690 (11)	8610 (09)
954 OCOTILLO	7240 (20)	6890 (11)	6910 (10)	5950 (14)	6000 (14)	5460 (14)	7790 (35)	8120 (19)	7930 (16)
980 WPB 8009	7250 (19)	7400 (08)		6200 (09)	6880 (02)		8200 (25)	8880 (10)	
983 FMC 5318	7680 (11)	7690 (04)		6660 (01)	6490 (03)		9930 (03)	9610 (04)	
988 UC 988	6560 (34)	5710 (21)		5620 (29)	5770 (17)		8230 (23)	8650 (12)	
989 UC 989	6540 (35)	5910 (19)		5730 (25)	5600 (18)		8010 (29)	8320 (18)	
1024 WPB 8010	7280 (18)			6010 (11)			8680 (16)		
1025 WPB 8011	7810 (09)			5880 (20)			8940 (11)		
1026 WPB 8012	8230 (05)			6150 (10)			8710 (14)		
1027 UC D93-202	7350 (15)			6610 (03)			9930 (04)		
1028 UC D93-219	8760 (02)			6420 (06)			9010 (10)		
1029 UC D93-223	6650 (32)			5100 (36)			8690 (15)		
1030 UC D93-209	6910 (27)			6560 (04)			9240 (08)		
1031 UC D93-231	7050 (23)			5610 (30)			8870 (13)		
1043 FMC 1138	6920 (26)			5730 (24)			8680 (17)		
1044 FMC 53178	6860 (28)			5900 (16)			9240 (07)		
1045 FMC 8095	8360 (04)			5880 (21)			7940 (32)		
1046 FMC 8241	7570 (12)			5960 (13)			8200 (24)		
1047 DESERT TITAN	7490 (13)			5760 (23)			8230 (22)		
1048 APB D90-12	7240 (21)			5280 (35)			7820 (34)		
1049 APB D50#1	7920 (07)			6550 (05)			8630 (18)		
1050 APB D881-5	6680 (30)			4950 (37)			7970 (30)		
MEAN	7320	6920	7140	5890	6120	5830	8610	8860	8720
CV	7.3	8.4	7.8	6.1	7.8	9.6	6.2	6.1	6.1
LSD (.05)	740	570	450	500	470	450	750	530	430

Numbers in parentheses indicate relative rank in column.

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Table 14.b.1 ***Plant Height (in centimeters) on Kronos, WB 881 and Turbo Durums Grown at 3 Locations for 1992 and 1993 by Arizona Plant Breeders.***

	Casa Grande, AZ		Shafter, CA		El Centro, CA		
Variety	**1992**	**1993**	**1992**	**1993**	**1992**	**1993**	**MEAN HEIGHT**
Kronos	88	89	87	86	88	87	87.5
WB 881	86	86	85	87	85	84	85.5
WB Turbo	94	93	91	92	95	94	93.2

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	*WB 881*
Mean	87.5	85.5
Variance	1.1	1.1
Observations	6	6
Pooled Variance	1.1	
Hypothesized Mean Difference	0	
df	10	
t	3.302891	
P(T<=t) one-tail	0.003987	
t Critical one-tail	1.812462	
P(T<=t) two-tail	0.007974	
t Critical two-tail	2.228139	

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	*WB Turbo*
Mean	87.5	93.16667
Variance	1.1	2.166667
Observations	6	6
Pooled Variance	1.633333	
Hypothesized Mean Difference	0	
df	10	
t	-7.67982	
P(T<=t) one-tail	8.4E-06	
t Critical one-tail	1.812462	
P(T<=t) two-tail	1.68E-05	
t Critical two-tail	2.228139	

[C:\EXCEL\KRON_HT.XLS]

Table 14.b.2 ***Heading Date (in days to heading after planting) for Kronos, WB 881 and Turbo Durums Grown at 3 Locations for 1992 and 1993 by Arizona Plant Breeders.***

	Casa Grande, AZ		Shafter, CA		El Centro, CA		MEAN HEADING DATE
Variety	**1992**	**1993**	**1992**	**1993**	**1992**	**1993**	
Kronos	80	79	88	85	79	81	82.0
WB 881	81	82	89	86	81	82	83.5
WB Turbo	92	93	97	94	91	93	93.3

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	*WB 881*
Mean	82	83.5
Variance	13.6	10.7
Observations	6	6
Pooled Variance	12.15	
Hypothesized Mean Difference	0	
df	10	
t	-0.74536	
P(T<=t) one-tail	0.236606	
t Critical one-tail	1.812462	
P(T<=t) two-tail	0.473212	
t Critical two-tail	2.228139	

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	*WB Turbo*
Mean	82	93.33333
Variance	13.6	4.266667
Observations	6	6
Pooled Variance	8.933333	
Hypothesized Mean Difference	0	
df	10	
t	-6.56767	
P(T<=t) one-tail	3.17E-05	
t Critical one-tail	1.812462	
P(T<=t) two-tail	6.33E-05	
t Critical two-tail	2.228139	

[C:\EXCEL\KRONHEAD.XLS]

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Table 14.b.3 ***Kernel Count (in numbers of seed per head) for Kronos, WB 881 and Turbo Durums Grown at 3 Locations for 1992 and 1993 by Arizona Plant Breeders.***

	Casa Grande, AZ		Shafter, CA		El Centro, CA		
Variety	**1992**	**1993**	**1992**	**1993**	**1992**	**1993**	**MEAN KERNEL COUNT PER HEAD**
Kronos	80	82	82	81	80	79	80.7
WB 881	63	64	61	62	59	62	61.8
WB Turbo	90	91	92	90	89	92	90.7

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	***WB 881***
Mean	80.66667	61.83333
Variance	1.466667	2.966667
Observations	6	6
Pooled Variance	2.216667	
Hypothesized Mean Difference	0	
df	10	
t	21.90976	
P(T<=t) one-tail	4.39E-10	
t Critical one-tail	1.812462	
P(T<=t) two-tail	8.78E-10	
t Critical two-tail	2.228139	

t-Test: Two-Sample Assuming Equal Variances (0.05 confidence level)

	Kronos	***WB Turbo***
Mean	80.66667	90.66667
Variance	1.466667	1.466667
Observations	6	6
Pooled Variance	1.466667	
Hypothesized Mean Difference	0	
df	10	
t	-14.3019	
P(T<=t) one-tail	2.76E-08	
t Critical one-tail	1.812462	
P(T<=t) two-tail	5.52E-08	
t Critical two-tail	2.228139	

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Table I.a. Yield and Agronomic Data on Kronos and other desert Durum Varieties in Trials Conducted by the University of Arizona—Maricopa Station in 1991 and 1993.

	Heading Date		Plant Height (cm.)		Lodging %		Test Weight (lbs./bu.)		Yield (lbs./ac.)	
Variety	1991	1993	1991	1993	1991	1993	1991	1993	1991	1993
Kronos	**3/10**	**3/10**	**102**	**88**	**20%**	**35%**	**62**	**63**	**5,866**	**6,608**
WB 881	3/11	3/14	96	84	20%	57%	64	62	4,433	6,633
WB Turbo	4/1	3/25	104	94	40%	90%	63	63	6,666	6,810

Table I.b. Yield and Agronomic Data on Kronos and other Desert Durum Varieties in Trials Conducted by the University of California in Imperial, CA in 1992 and 1993.

	Heading Date (days after January 1)		Plant Height (cm.)		Lodging %		Test Weight (lbs./bu.)		Yield (lbs./ac.)	
Variety	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
Kronos	**78**	**70**	**94**	**84**	**60%**	**48%**	**61**	**62**	**8,750**	**9,430**
WB 881	79	74	92	82	58%	23%	60	61	7,860	9,180
WB Turbo	85	83	99	97	63%	20%	60	63	9,280	10,380

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Table I.c. Yield and Agronomic Data on Kronos and other Desert Durum Varieties in Trials Conducted by Arizona Plant Breeders in 1991, 92 & 93 at Casa Grande, AZ.

	Heading Date			Plant Height (cm.)			Lodging %			Test Weight (lbs./bu.)			Yield (lbs./ac.)		
Variety	1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993
Kronos	**3/6**	**3/4**	**3/5**	**90**	**88**	**86**	**5%**	**10%**	**10%**	**63**	**63**	**63**	**6,623**	**6,276**	**6,339**
WB 881	3/8	3/4	3/7	86	85	83	0%	0%	0%	63	63	62	5,229	5,580	6,015
WB Turbo	3/22	3/20	3/24	96	94	92	30%	10%	40%	64	64	64	5,810	6,350	7,380

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Table II.a. Quality Comparison of Kronos and WestBred 881 Performed by Barilla Pasta Company in 1991.

Variety	Test Weight (KG/HL)	Grain % Protein	Grain % Gluten	Semolina % Protein	Semolina % Gluten	W	P/L[1]	Semolina YellowColor[2]	Pasta Value[3] n° 2	Sample Origin & Size
Kronos	**84.20**	**13.13%**	**9.00%**	**12.21%**	**11.00%**	**182**	**1.41**	**26.6**	**79**	Casa Grande, AZ 5kg
Kronos	**85.50**	**12.20%**	**10.60%**	**11.80%**	**10.00%**	**160**	**1.32**	**29.0**	**n/a**	Casa Grande, AZ 20mt
WB 881	82.60	15.03%	10.80%	13.88%	12.90%	105	0.48	25.2	76	Vessel (Arizona)

Table II.b. Quality Comparison of Kronos and WestBred 881 Performed by Barilla Pasta Company in 1992.

Variety	Test Weight (KG/HL)	Grain % Protein	Grain % Gluten	Semolina % Protein	Semolina % Gluten	W	P/L[1]	Semolina YellowColor[2]	Pasta Value[3] n° 2	Sample Origin & Size
Kronos	**81.10**	**16.03%**	**11.10%**	**15.54%**	**13.00%**	**291**	**1.72**	**27.5**	**88**	Casa Grande, AZ 20mt
WB 881	82.60	15.03%	10.80%	13.88%	12.90%	105	0.48	25.2	76	Vessel (Arizona 1991)

FINISHED PASTA EVALUATION

	Yellowness Indication	Actual Pasta Value
Kronos	**26.30**	**86.0**
WB 881	23.80	86.5

Footnotes:

[1] Both the W Value and P/L figures are from the Alveogram which gives an estimate of the final Pasta quality.

[2] Yellowness indication higher number = more yellow color.

[3] Pasta Value is quality estimate on the finished pasta by use of quality data (higher number is better).

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