1.

CLASSIFICATION OF INBRED LINES OF CORN *

W. T. Federer

Corn constitutes a very important part of American and, to a lesser extent, foreign agriculture. Hybrid corn is rapidly replacing the older grown varieties in most sections where corn is produced in any quantity. There are numerous kinds of hybrids. The inbred lines of corn that go to make up these combinations are also numerous. At this time, there is no published classification for these many and diverse inbred lines. Such a classification has a great deal of practical value.

At the present time, there is a good deal of secrecy between the different producers in regard to the pedigrees of certain hybrid combinations. A definite classification and complete description of a line would allow the line to be readily recognizable. This would help to do away with the need for secrecy.

The hybrid seed corn inspectors would have a definite means of checking on a combination. A producer would not be able to mislabel the double cross combination and sell it under a different hybrid number. Such a method for detection is not now available.

* The preliminary work on this project was reported by W. T. Federer: "A Classification for inbred lines of corn", M.S. Thesis, Kansas State College, 1941. A large part of this mimeographed material appears in the Annual Reports of Corn Investigations at Kansas State College, 1940 (pages 310 through 315) and 1941 (pages 399 through 413), under R. W. Jugenheimer.
Another purpose afforded by such a key, is the standardization of line nomenclature. At present, some lines have several different designations. Each station previously had a different system of naming lines; some used numbers, some used letters, and others used a combination of letters and numbers. There has recently been a trend toward standardization and simplification of line nomenclature. The experiment stations of some of the corn growing states have been given a certain letter to precede the number that is ascribed to that line. Each state has a different letter in order to avoid confusion. The letter is the first letter in the state's name, except in those cases where two or more states have names that begin with the same letter. In such cases, another letter or group of letters has been assigned to that state.

The enclosed material is being mimeographed and distributed to people in corn investigations. This is being done since several requests have been received for the keys on inbred lines of corn. Furthermore, this material has been brought together in part as thanks to the various research stations who co-operated so willingly in supplying the inbred lines.

In all there were 208 lines from 13 states. In addition, four more states (Colorado, South Dakota, New York, and Oklahoma) were contacted, but did not send inbred lines which could be included in the test. The following list gives the state and the number of inbred lines from each state.

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The miscellaneous five lines were not included in the key since insufficient data was obtained on them. The five lines were Indiana JC33, Iowa KR (osf), Iowa 198, Wisconsin CC25, and Wisconsin CC26. The two lines JC33 and KR (osf) were included in the classification of inbred lines given by the author in his Master's thesis. Therefore, the enclosed keys contain the classification of 203 lines instead of 208.

In using these keys it is suggested that each investigator use an abridged key involving only those lines in which he is interested. This will make the key much easier to follow and less cumbersome. In a few instances, two lines occupy the same position in the key. In some cases it was known that the lines were almost identical, but in others it was not certain that this was true. A further study will be needed to discriminate between the lines that appear in the same positions in a key.

The classification was based on one year's results of the inbred lines grown at three different locations, the three locations being at two replicates at the Agronomy Farm at Kansas State College, and the third at the Soil Conservation Service Nursery. The first two replicates were on dry land and the third was irrigated with overhead sprinklers. Although some minor discrepancies (due to different manifestations of some characters under different environments) with the enclosed keys may be found in the future, it is felt that in general no major changes in the classifications will be made.

Listing of the inbred lines with the originating station, the parent variety where available, synonyms for the various inbred lines where available, and some kernel and cob characteristics, is given below.
<table>
<thead>
<tr>
<th>Originating station</th>
<th>Inbred line</th>
<th>Parent variety</th>
<th>Synonyms</th>
<th>Color of seed</th>
<th>Size</th>
<th>Chaff color</th>
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Numerous notes could be taken with regard to characteristics in corn. Prior to taking the notes on the 203 inbred lines of corn in the summer of 1941, an outline of possible taxonomic notes was made. This outline was followed to some extent. It is given below as a probable aid to future workers on the classification of inbred lines of corn—

(next page)
I Plant Characters
A. Stand.
B. Vigor.
   1. Early
   2. Late
C. Maturity.
   1. Days to ½ pollen
   2. " " silk
   3. " of ripening
D. Height.
   1. Plant
   2. Ear
E. Lodging Resistance.
   1. Root ) early
   2. Stalk ) early
F. Disease resistance.
   1. Diplodia
   2. Smit
G. Insect resistance.
   1. Corn ear worm
   2. Aphids
   3. Chinch bug
   4. Grasshopper
H. Drought resistance.
   1. Leaf surface fired
I. Yield.
   1. Grain
   2. Fodder
J. Ears per plant.
K. Shank length.

II. Culm Characters.
A. Color.
B. Diameter (early
C. Internode length.
D. Nodes above ground.
   1. Number
      a. to car
      b. total
   2. Prominence
E. Brace roots.
   1. Size
   2. No. of nodes arising
F. Suckers.
   1. Number
   2. Size

III. Leaf Characters.
A. First leaf.
   1. Shape
   2. Size
B. Leaf curl.
   1. Opening
      a. Size
      b. Shape
   2. No. of leaves
   3. Projection of top leaf

III Leaf Characters (contd.)
C. Blade.
   1. Color of blade
   2. Color of midrib
   3. Stripedness
   4. Wrinkling
   5. Erectness
   6. Rigidity
   7. Waviness
   8. Length
   9. Width
10. Flatness
11. Creasing lengthwise
12. Splotching
13. Pubescence
   a. upper surface
   b. lower "
   c. edge
   d. on seading
D. Ligule.
   1. Height
   2. Character
E. Auricles.
F. Collar.
   1. Pubescence
G. Sheath.
   1. Pubescence on edges
   2. Extent culm is covered
   3. Closed on upper part of culm
   4. Length in rel. to internode
   5. Color
   6. No. of sheaths colored
   7. Length of sheath
H. Flag leaf.
   1. Rigidity
   2. Size
   3. Position in rel. to tassel
I. Two-ranked

IV. Tassel Characters.
A. Type.
B. Length.
C. Central Spike.
   1. Length
      a. total
      b. in rel. to tassel length
   2. Rows of spikelets
   3. Shape
D. Branches.
   1. Length
      a. actual
      b. in rel. to tassel length
   2. Number
   3. Density
      a. no. spikelets per unit length
      b. arrangement
   4. Barness of inner side of
      5. Rows of spikelets(2-4).
IV. Tassel Characters (contd.)

E. Spikelet.
   1. Pedicel length
      a. upper
      b. lower

F. Glume.
   1. Color
      a. tip
      b. base
      c. edge
      d. nerves
      e. middle
   2. Size.
      a. length
         i. upper
         ii. lower
      b. width
         i. upper
         ii. lower
   3. Nerves.
      a. number
         i. upper spikelet
            (a) first glume
            (b) second glume
         ii. lower spikelet
            (a) first glume
            (b) second glume
      b. pubescence

G. Lemma.
   1. Size.
      a. length
      b. width
   2. Nerves.
      a. parallel or converging
      b. number
      c. Distinctness
   3. Shape
   4. Nature of the tip

H. Palea (outer & inner may differ).
   1. Size
      a. length
      b. width
   2. Nerves
      a. parallel or converging
      b. number
      c. distinctness
   3. Shape
   4. Nature at tip

I. Stamen.
   1. Anther color (at pollen)
   2. Anther shape
   3. " length
   4. Pollen shedding
      a. amount
   5. Anther color (later)
   6. Filament
      a. shape
      b. character
   7. Deciduous or persistent

IV. Tassel Characters (contd.)

J. Peduncle.
   1. size.
   K. Protrusion above flag leaf.

V. Silk Characters.
   A. Style.
      1. Color
   B. Stigma.
      1. Color
      2. Relative size
      3. " amount

VI. Ear Characters.
   A. Length.
   B. Shape.
   C. Kernel rows.
      1. Number
      2. Arrangement
   D. Cob color.

VII. Kernel Characters.
   A. Color.
   B. Shape.
   C. Size.
   D. Germ.
      1. Size
      2. Indentation
   E. Denting.
      1. Amount
      2. Nature
   F. Nature of tip cap.
   G. Amount of starchy material.
   H. " " corneous "

VIII. Root Characters.
   A. Seedling.
   B. Mature plant.
Two keys to inbred lines of corn were made. The vegetative key was made to facilitate the roguing of off-type plants due to mixing or cross-pollination. Furthermore, it is possible, with the aid of this key, to get an estimate of the number of rogues in a field.

Of the two keys, it is felt that the vegetative key will need the most revisions. The mature plant key will be quite useful to the inspectors in deciding whether or not to certify a field of seed corn. Inspection before tasselling may indicate the field as suspect of having more than the acceptable number of off-type plants. The inspector will be able to verify or disprove his doubts with the use of the mature plant key.
VEGETATIVE KEY TO INBRED LINES OF THE UNITED STATES

W. T. Federer

1a. Lower sheaths green or mostly so.
2a. Leaves heavily wrinkled.
3a. Leaves dark green.
4a. Leaves very wavy.
5a. Leaves rigid --------------------------1a. 44
5b. Leaves semirigid to nonrigid.
6a. Leaves creased lengthwise, large wrinkles, large waves, shiny dark green -----------------------USDA 137-2
6b. Leaves mediumly creased lengthwise --------------------------1b. R136
4b. Leaves midway to nonwavy; semirigid, midrect.
5a. Leaves heavily creased lengthwise.
6a. Plants very vigorous ------------------------Ind. H5
6b. Plants midvigorous; large waves and wrinkles in leaves --------------------------K 124
5b. Leaves little creased lengthwise --------------------------N. J. A47

3b. Leaves medium green.
4a. Leaves very wavy, nonerect, wide, long --------------------------K 214
4b. Leaves midway.
5a. Leaves rigid, wide --------------------------Iowa 447
5b. Leaves semirigid.
6a. Leaves erect --------------------------Mo. 7Ra
6b. Leaves midrect.
7a. Leaves heavily creased lengthwise; plants vigorous.
8a. Large waves, small wrinkles in leaves --------------------------Minn. A357
8b. Midlarge waves, midlarge wrinkles in leaves --------------------------I11. 5120
7b. Leaves mediumly creased lengthwise.
8a. Plants very vigorous. --------------------------Ky. 124
8b. Plants midvigorous.
9a. Leaves V-shaped, narrow --------------------------Wisc. 002
9b. Leaves flat or nearly so.
10a. Leaf curl opening midlarge; midrib greenish --------------------------Ky. 39
10b. Leaf curl opening small; midrib whitish in color.
11a. Leaf curl opening flattened --------------------------N. J. B42
11b. Leaf curl opening round --------------------------Minn. A142

2b. Leaves midwrinkled to nonwrinkled.
3a. Leaves very dark green, semirigid, midrect.
4a. Leaves very wavy, heavily creased lengthwise; culms large --------------------------K 55
4b. Leaves midway, semirigid, midrect.
5a. Leaves heavily creased lengthwise.
6a. Leaves short --------------------------Iowa 153
6b. Leaves midlong.
7a. Leaf curl opening small; wrinkles in leaves small --------------------------Minn. A94
7b. Leaf curl opening midlarge; wrinkles in leaves midlarge --------------------------Minn. A334
(Vegetative key contd.)

5b. Leaves midcreased to noncreased lengthwise.
6a. Leaves midcreased lengthwise, wide; plants vigorous
6b. Leaves not creased lengthwise, midwide; plants midvigorous

3b. Leaves midgreen.
4a. Leaves very wavy.
5a. Leaves rigid, erect, noncreased lengthwise, narrow.
6a. Leaf curl opening small
6b. Leaf curl opening midlarge
5b. Leaves semirigid.
6a. Leaves erect
6b. Leaves midrect.
7a. Leaves midgreen, heavily creased lengthwise ---Ohio 56
7b. Leaves midwide, midcreased lengthwise
8a. Plants vigorous
8b. Plants midvigorous.
9a. Midrib greenish
9b. Midrib white

4b. Leaves midwavy to nonwavy.
5a. Leaves rigid, erect, noncreased lengthwise; plants vigorous.
6a. Leaves V-shaped, long ---Tex. 158-4
6b. Leaves flat or nearly so, midlong.
7a. Waves in leaf small; leaf curl opening large
7b. Waves in leaf midlarge; leaf curl opening small
5b. Leaves semirigid to nonrigid.
6a. Leaves erect; plants weak
6b. Leaves midrect.
7a. Leaves heavily creased lengthwise.
8a. Plants vigorous.
9a. Leaves revolute ---Wisc. CCl
9b. Leaves flat.
10a. Leaves midsplotched; leaf curl opening midlarge ---Minn. C20
10b. Leaves nonsplotched; leaf curl opening small
3b. Plants not especially vigorous.
9a. Plants weak; midrib greenish; leaf curl opening large ---K 201A
9b. Plants midvigorous.
10a. Leaves V-shaped, short, midsplotched ---Minn. C16
10b. Leaves flat or nearly so.
11a. Leaves wide, midlong ---K 230
11b. Leaves midwide.
12a. Leaves long; midrib greenish; leaf curl opening small ---Wisc. CC5
12b. Leaves not long.
(Vegetative key contd.)

13a. Leaves midlong; midrib green; leaf curl opening small
     Minn. A26
13b. Leaves short.
     14a. Midrib green; leaf curl opening small
         Minn. A116
     14b. Midrib whitish; leaf curl opening midlarge
         Minn. A7

7b. Leaves not heavily creased lengthwise.
8a. Leaves not creased lengthwise.
9a. Plants weak; leaves short
    K 4
9b. Plants midvigorous.
  10a. Leaves narrow; midlong
       Minn. A347
  10b. Leaves midwide, long
       Ky 21

3b. Leaves midcreased lengthwise.
9a. Plants vigorous.
  10a. Leaves V-shaped, midsplotted
       Minn. A392
  10b. Leaves not V-shaped.
     11a. Leaves revolute, long
         USDA 9
     11b. Leaves flat or nearly so, midlong;
          leaf curl opening small.
     12a. Midrib greenish
          Iowa 349
     12b. Midrib white.
     13a. Leaves not striped
          Ohio 33
     13b. Leaves partly striped
          Minn. A275

9b. Plants midvigorous; leaves flat or nearly so.
10a. Leaves wide.
    11a. Leaves long; culms midlarge
         Ky 132
    11b. Leaves midlong; culms midlarge.
    12a. Leaves midsplotted; leaf curl
         opening midlarge
         Iowa Pr
    12b. Leaves nonsplotted; leaf curl
         opening large; leaves a characteristic whitish green
         Mo G

10b. Leaves not wide.
    11a. Leaves narrow.
    12a. Leaves short, midsplotted; leaf curl
         opening small
         Minn. A12
    12b. Leaves midlong, nonsplotted; leaf curl
         opening midlarge
         K 17
    11b. Leaves midwide.
    12a. Leaves midlong
         Ohio 51A
    12b. Leaves short.
     13a. Culm small; midrib white
         Minn A148
     13b. Culm midlarge; midrib greenish
         Minn. A145

1b. Lower sheaths distinctly not green, but a purplish hue over green or mostly purplish.
2a. Leaves heavily wrinkled.
3a. Leaves dark green, midwavy to nonwavy.
4a. Leaves rigid.
5a. Leaves crock, not creased lengthwise
    USDA 3
5b. Leaves midcrock, heavily creased lengthwise--Ill R4
(Vegetative key contd.)

4b. Leaves semirigid to nonrigid.
5a. Leaves erect; culms small --------------------La. 503
5b. Leaves midcork.
6a. Leaves long, not creased lengthwise -------Ky. 34
6b. Leaves midlong, midcreased lengthwise.
7a. Leaves nonerect, nonstriped -------------------Iowa 426
7b. Leaves midcork, striped -------------------Ill. FL14

3b. Leaves midgreen to light green.
4a. Leaves very wavy.
5a. Leaves nonrigid, long, flat -------------------Fla. 4
5b. Leaves semirigid.
6a. Leaves V-shaped, midlong -------------------Ky. 36
6b. Leaves flat or nearly so, long; midrib green---Ky. 36-18
4b. Leaves midwavy or nonwavy.
5a. Leaves nonwavy, noncreased lengthwise, erect;
   culms small --------------------------------Tex. 132A
5b. Leaves midwavy.
6a. Leaves rigid.
7a. Leaves erect; midrib green.
8a. Leaves heavily creased lengthwise; plants
   midvigorous ---------------------------------N.J. A30
8b. Leaves not creased lengthwise, light green;
   plants weak -----------------------------Iowa 159
7b. Leaves midcork; midrib mostly white.
8a. Leaves heavily creased lengthwise, revolute---Iowa 397
8b. Leaves not heavily creased lengthwise, flat
   or nearly so.
9a. Plants weak; leaves short -------------------Iowa 345
9b. Plants vigorous; leaves midlong -------------------Iowa 159FL
6b. Leaves semirigid or nonrigid.
7a. Leaves nonrigid, midcork, heavily creased
   lengthwise.
8a. Leaves midlong; midrib green -------------------Ohio 84
8b. Leaves long; midrib white -------------------USDA 4-8
7b. Leaves semirigid.
8a. Leaves erect; short -------------------Iowa 234
8b. Leaves midcork.
9a. Leaves heavily creased lengthwise.
10a. Leaves nonsplotched; plants midvigorous;
   midrib green -------------------Ky. 114
10b. Leaves midsplotched to heavily splotched;
   plants vigorous; midrib white.
11a. Leaf curl opening small -------------------Minn. A174
11b. Leaf curl opening midlarge -------------------Conn. 14
9b. Leaves not heavily creased lengthwise.
10a. Leaves not creased lengthwise.
11a. Leaves long; leaf curl opening midlarge--Ky. 49
11b. Leaves midlong; leaf curl opening large--Ky. 17
10b. Leaves midcreased lengthwise.
11a. Plants very vigorous; leaves long -------Ind. B2
11b. Plants not very vigorous.
12a. Plants weak; wrinkles in leaves large --Iowa 289
12b. Plants midvigorous.
13a. Leaves V-shaped, long, midwide ---------------Minn. A71
Vegetative key (contd.)

13b. Leaves flat or nearly so, wide, midlong.
14a. Culms large ————-Minn. A73
14b. Culms midlarge ———-Wisc. CC24

2b. Leaves not heavily wrinkled.
3a. Leaves dark green.
4a. Leaves nonwavy, noncreased lengthwise, V-shaped.
5a. Leaves rigid, midcrect ————-Ky. 13
5b. Leaves nonrigid, erect.
6a. Leaves long, midspotted ———-Fla. 2
6b. Leaves midlong, nonspotted, light green
stripes between dark green ————-Mo. L3

4b. Leaves midway.
5a. Leaves rigid.
6a. Leaves heavily creased lengthwise, short;
plants vigorous; culms midlarge ————-Minn. A344
6b. Leaves midcreased lengthwise, midlong, mid-
spotted; plants midvigorou; culms large;
midrib green ———-Tenn. J8-6G
5b. Leaves midrigid or nonrigid.
6a. Leaves nonrigid.
7a. Leaves crect, noncreased, light green stripes
between dark green ————-Iowa 317
7b. Leaves midcrect, midcreased lengthwise,
nonstriped ———-Ill. 55
6b. Leaves semirigid, midwide.
7a. Leaves crect, midlong.
8a. Leaves noncreased lengthwise, flat or
nearly so, midspotted; plants vigorous;
culms large ———-K 148
8b. Leaves midcreased lengthwise, nonspotted.
9a. Leaves revolute; plants midvigorou——-N.J. A12
9b. Leaves flat or nearly so; plants vigorous——-Ind. 33-16
7b. Leaves midcrect.
8a. Leaves noncreased lengthwise, long; culms
large ———-Fla. 1
8b. Leaves midcreased lengthwise, midlong;
culms midlarge.
9a. Plants midvigorou; leaves midspotted——Ohio 65
9b. Plants vigorous; leaves nonspotted.
10a. Leaf curl opening small ———-Ind. H22
10b. Leaf curl opening midlarge ———-USDA 7

3b. Leaves not dark green.
4a. Leaves not midgreen.
5a. Leaves yellowish green ———-Ky. 11B, USDA 11b-71
5b. Leaves light green.
6a. Leaves very wavy, V-shaped ———-Ky. 46
6b. Leaves midway to nonwavy.
7a. Leaves nonwavy.
8a. Leaves rigid, crect, long ———-La. 30-2
8b. Leaves semirigid, midlong.
9a. Leaves noncrect, heavily creased length-
wise, narrow ———-Wisc. M50
9b. Leaves crect, noncreased lengthwise,
midwide, V-shaped ———-La. 25
7b. Leaves midwavy.

8a. Leaves rigid; plants vigorous
8b. Leaves midwavy; plants weak

9a. Leaves erect, midstriped
9b. Leaves midbent, nonstriped

10a. Leaves not creased lengthwise, narrow, midlong
10b. Leaves midcreased lengthwise, midwide, long

3b. Leaves semirigid to nonrigid.
3a. Leaves nonrigid, noncreased lengthwise
3b. Leaves semirigid

4a. Leaves erect, midstriped ——————-Iowa 224
4b. Leaves midbent, nonstriped

10a. Leaves not creased lengthwise, narrow, midlong ——————-Ill. Hy
10b. Leaves midcreased lengthwise, midwide, long ———————-K 130

8b. Leaves semirigid to nonrigid.
8a. Leaves nonrigid, noncreased lengthwise ————-La. 548
8b. Leaves semirigid

10a. Leaves erect, midstriped
11a. Leaves nonstriped, midlong —————-Conn. 21
11b. Leaves little striped, long —————-La. 515
10b. Leaves midbent
11a. Leaves heavily creased lengthwise, wide; midrib green ————La. 77
11b. Leaves not heavily creased lengthwise.

12a. Leaves noncreased lengthwise, long, flat or nearly so.
13a. Leaves narrow ———————-K 60
13b. Leaves midwide; culms large —————-K 153, KYS—58
12b. Leaves midcreased lengthwise.

13a. Plants vigorous, leaves midstriped—-Iowa 420
13b. Plants midvigoroua.

14a. Leaves very wide —————-Ky. 58
14b. Leaves midwide.

15a. Leaves midstriped —————-USDA 1
15b. Leaves nonstriped.

16a. Leaves long; leaf curl opening very large —————-La. 569
16b. Leaves midlong; leaf curl opening large ———————-Ill. 5678

4b. Leaves midgroen.
5a. Leaves very wavy, midbent.
6a. Leaves rigid, noncreased lengthwise.

7a. Leaves narrow —————-K 168
7b. Leaves midwide —————-K 159
6b. Leaves somirigid.

7a. Leaves noncreased lengthwise.
8a. Plants vigorous; culms large; leaves long ———USDA 5
8b. Plants midvigoroua; culms midlarge; leaves midlong —————Ky. 41

7b. Leaves midcreased lengthwise.
8c. Plants vigorous; leaves long —————-Ind. Tr
8b. Plants midvigoroua or weak; leaves midlong.
9a. Plants weak; leaves nonstriped ———Ohio 28
9b. Plants midvigoroua; leaves striped ———USDA 6

5b. Leaves midwavy or nonwavy.
6a. Leaves nonwavy.
7a. Leaves rigid.

8a. Leaves erect, midlong; plants midvigoroua ———-La. 30
8b. Leaves midbent, long; plants vigorous ———USDA 2
7b. Leaves semirigid or nonrigid.
8a. Leaves nonrigid, heavily creased lengthwise.
  9a. Plants vigorous; culms midlarge ---------------Minn. C11
  9b. Plants midvigorous; culms small.
  10a. Leaf curl opening midlarge ---------------Minn. A155
  10b. Leaf curl opening small ---------------Minn. A158

8b. Leaves semirigid.
  9a. Leaves erect.
  10a. Leaves narrow, midlong -----------------Tex. 102A
  10b. Leaves midwide, long -------------------Fla. 3

9b. Leaves midrect.
  10a. Leaves noncreased lengthwise; plants weak --------------------------K 41
  10b. Leaves heavily creased lengthwise; plants midvigorous ---------------Minn. C19

6b. Leaves midwavy.
  7a. Leaves rigid.
  8a. Leaves erect.
  9a. Leaves midcreased lengthwise ---------------La. 10
  9b. Leaves noncreased lengthwise.
       10a. Midrib green. ---------------La. 5
       10b. Midrib white.
       11a. Leaves narrow, midlong, midsplotched ----La. 24
             11b. Leaves midwide, long, nonsplotched ----La. 87

8b. Leaves midrect.
  9a. Leaves noncreased lengthwise.
       10a. Leaves flat or nearly so ----------------Ky. 35-7
       10b. Leaves V-shaped.
             11a. Plants vigorous; leaves short ---------------La. 501
             11b. Plants midvigorous; leaves midlong ----K 179

9b. Leaves midcreased lengthwise.
  10a. Plants vigorous; culms large ---------------Ky. 122
  10b. Plants midvigorous.
       11a. Leaves V-shaped --------------------------K 126
             11b. Leaves flat or nearly so.
             12a. Leaves narrow, midlong ---------------La. 504
             12b. Leaves midwide, short.
             13a. Leaves midsplotched -------------------N. J. 90
             13b. Leaves nonsplotched -------------------La. 27

7b. Leaves semirigid or nonrigid.
  8a. Leaves nonrigid, midrect.
  9a. Leaves heavily creased lengthwise; culms small -----------------------------Wisc. 008
  9b. Leaves midcreased or noncreased lengthwise.
       10a. Plants vigorous; leaves V-shaped, narrow, long ---------------K 61

8b. Leaves semirigid.
  9a. Leaves erect midwide, midlong.
  10a. Leaves noncreased lengthwise; culms large ----------------Ky. 35-35
10b. Leaves midcreased lengthwise; culms midlarge.
11a. Leaves very little wrinkled, wrinkles small———-K 130
11b. Leaves midwrinkled, wrinkles midlarge———-Ky. 30-A
9b. Leaves midcreased or noncreased.
10a. Leaves noncreased.
11a. Leaves heavily creased lengthwise, narrow———-Minn. C14
11b. Leaves midcreased lengthwise, midwide———-Wis. CC7
10b. Leaves midcreased.
11a. Leaves heavily creased lengthwise,
12a. Plants vigorous.
13a. Leaves V-shaped, narrow———-La. 562
13b. Leaves flat or nearly so, midwide———-Minn. B164
12b. Plants midviborous.
13a. Culms small; leaves nonsplotched———-Minn. A28
13b. Culms midlarge; leaves midsplitached———-Mo. 21a
11b. Leaves midcreased or noncreased lengthwise.
12a. Leaves noncreased lengthwise,
13a. Plants vigorous; leaves V-shaped———-Ohio 51
13b. Plants midvigorous or weak.
14a. Plants weak———-K 226
14b. Plants midvigorous.
15a. Leaves V-shaped, midwide, midlong.
16a. Culms small———-Ky. 27
16b. Culms midlarge———-USDA 43
15b. Leaves flat or nearly so.
16a. Leaves narrow, midlong.
17a. Culms small; midrib green———-Minn. A322
17b. Culms midlarge; midrib white———-Ky. 56
16b. Leaves midwide; culms midlarge.
17a. Leaves midsplotched———-La. 62
17b. Leaves nonsplotched,
18a. Leaf curl opening flattened———-Nebr. N6
18b. Leaf curl opening round.
19a. Leaf curl opening large.
20a. Leaves long, wrinkles small———-Iowa 401
20b. Leaves midlong, wrinkles midlarge———-La. 13
19b. Leaf curl opening not large.
20a. Plants glaucous———-K 167
20b. Plants not glaucous.
21a. Midlarge waves, small wrinkles in leaves———-La. 568
21b. Small waves, midlarge wrinkles in leaves———-Minn. A311

12b. Leaves midcreased lengthwise,
13a. Plants vigorous.
14a. Leaves wide, midsplotched———-Ind. WF9
14b. Leaves midwide.
15a. Leaves long.
16a. Culms large; leaves nonwrinkled———-Conn. 20
16b. Culms midlarge; leaves midwrinkled.
17a. Midrib green———-Ind. 66
17b. Midrib white.
18a. Leaf curl opening midlarge———-Mich. 1450
18b. Leaf curl opening small.
19a. Leaves partly striped———-Ind. 38-11
19b. Leaves nonstriped———-Mich. 1459

(Vegetative key contd.)
(Vegetative key contd.)

15b. Leaves midlong or short.
16a. Leaves short, midsplotted-------------------------------Wisc. CC4
16b. Leaves midlong.
17a. Leaf curl opening midlarge-------------------------------Ohio 67
17b. Leaf curl opening small.
18a. Leaves partly striped-------------------------------Mo. 557
18b. Leaves nonstriped-------------------------------Iowa 456

13b. Plants midvigorous.
14a. Leaves V-shaped.
15a. Leaves short---------------------------------------------Minn. 015
15b. Leaves midlong.
16a. Leaf curl opening small-------------------------------Minn. A340
16b. Leaf curl opening midlarge-------------------------------USDA 23
14b. Leaves flat or nearly so.
15a. Leaves wide, long, partly striped-------------------K 155
15b. Leaves midwide or narrow.
16a. Leaves narrow, long-------------------------------La. 510
16b. Leaves midwide.
17a. Leaves long.
18a. Leaf curl opening small-------------------------------Iowa 197
18b. Leaf curl opening midlarge-------------------------------La. 75
17b. Leaves midlong.
18a. Leaves striped-------------------------------K 8
18b. Leaves partly or nonstriped.
19a. Leaves partly stripcd.
20a. Leaf curl opening midlarge-------------------------------Ill. A
20b. Leaf curl opening small.
21a. Mostly 2 leaves per leaf curl-------------------------------Wisc. CC6
21b. Mostly 1 leaf per leaf curl-------------------------------Ohio 40B
19b. Leaves mostly nonstriped.
20a. Midrib green-------------------------------La. 27-2
20b. Midrib mostly white.
21a. Leaf curl opening flattened-------------------------------Ohio 26
21b. Leaf curl opening round.
22a. Wrinkles on leaves small; leaves tending
to dark green-------------------------------Iowa 205
22b. Wrinkles on leaves midlarge; leaves lighter than Iowa 205-------------------------------USDA 41
MATURE PLANT KEY TO INBRED LINES OF THE UNITED STATES

W. T. Federer

1a. Kernels white.
2a. Chaff red; base of glumes green; styles green.
3a. Tassel branches forming 20-70 degree angle with central spike; drooping.
4a. Anthers long; plants late-----------------------Fla. 1
4b. Anthers midlong; plants midseason----------------USDA 9
3b. Tassel branches forming less than 20 degrees angle with central spike; plants late, midtall to tall.
4a. Tassel branches and central spike drooping; stigmas red-----------------------------La. 27
4b. Tassel branches erect or mostly so; stigmas green.
5a. Tassel branches about 17 in number--------------------------La. 27-2
5b. Tassel branches about 25 in number--------------------------La. 62

2b. Chaff white.
3a. Base of glumes red or purple (except Ky.114 which is segregating); plants midtall to tall, midseason to late.
4a. Tassel branches forming less than 20 degree angle with central spike, about 10-15 in number.
5a. Styles red; stigmas red; plants midseason--------K 19
5b. Styles green.
6a. Stigmas red; plants late; tips of glumes red--La. 77
6b. Stigmas green.
7a. Plants tall; leaves midlong--------------------------La. 30
7b. Plants taller than above, more vigorous; leaves long----------------------------------La. 30-2
4b. Tassel branches forming a 20-70 degree angle with central spike; styles green.
5a. Stigmas red.
6a. Plants midseason, tall; leaves heavily wrinkled--Ky. 34
6b. Plants late, midtall; leaves midwrinkled--------La. 75
5b. Stigmas green.
6a. Plants midseason; leaves dark green, erect-----Ind.33-16
6b. Plants late; leaves miderect.
7a. Leaves not wrinkled, dark green-------------------Ky. 13
7b. Leaves heavily wrinkled, midgreen.
8a. Leaves not creased lengthwise, long---------------Ky. 49
8b. Leaves creased lengthwise, midlong---------------Ky. 114

3b. Base of glumes green.
4a. Tassel branches forming 20-70 degree angle with central spike.
5a. Tassel branches drooping.
6a. Styles red; stigmas red; plants early, short-----Conn. 20
6b. Styles green.
7a. Stigmas red; plants late, tall---------------------La. 13
7b. Stigmas green.
8a. Anthers red; plants late, tall---------------------La. 55
8b. Anthers purplish yellow or yellow.
9a. Plants midseason; lower sheaths purplish--------Ky. 21
9b. Plants late; lower sheaths purplish or mostly so.
10a. Tassel branches about 25 in number; tips of glumes red; plants midtall; leaves midgreen, crossed longwise------------------Mo. 21a
10b. Tassel branches about 16 in number; tips of glumes green; plants short; leaves greenish yellow in color, noncrossed longwise------USDA 11b

5b. Tassel branches erect.

6a. Tassel branches mostly less than 10 in number; styles green; stigmas green.

7a. Anthers dark purple; plants very early----------Minn. C15
7b. Anthers yellowish or purplish yellow; plants midseason

3a. Plants tall; leaves heavily wrinkled--------Ky. 17
8a. Plants midtall; leaves midwrinkled--------Ky. 30-A

6b. Tassel branches more than 10 in number.

2a. Styles green.

8a. Stigmas red.

9a. Anthers red or reddish green.

10a. Plants tall late; tips of glumes green; leaves midlong-------------------------K 60
10b. Plants midtall, midseason; tips of glumes red; leaves erect -----------------Conn. 21

9b. Anthers yellowish green.

10a. Tassel branches about 20 in number; tips of glumes green; leaves nonwavy---------K 17
10b. Tassel branches about 14 in number; tips of glumes red; leaves wavy.

11a. Leaves not V-shaped-------------------Ky. 41
11b. Leaves V-shaped----------------------------Ky. 46

8b. Stigmas green.

9a. Anthers red or roddish green.

10a. Plants tall late; tips of glumes green; leaves midlong-------------------------K 61
10b. Plants late; leaves not V-shaped.

11a. Tips of glumes red; leaves wavy, long, nonrigid ------------------Fla. 4
11b. Tips of glumes green.

12a. Culm color red; leaves midwrinkled; kernels large --------------------------Tex. 102a
12b. Culm color green or mostly so.

13a. Leaves nonwrinkled; kernels small--------La. 2-2
13b. Leaves heavily wrinkled; kernels midlarge-Ky. 124

9b. Tassel branches mostly 16-18 in number.

10c. Tips of glumes red.

11a. Leaves wavy, rigid, not V-shaped, narrow---------K 64
11b. Leaves midwavy, midrigid, V-shaped, midwide-USDA 43

10b. Tips of glumes green.

11a. Plants short; leaves crossed longwise.

12a. Plants very early; leaves nonwavy, midgreen-Minn. C20
12b. Plants midseason; leaves wavy, dark green-K 55
11b. Plants not short, late; leaves midcreased lengthwise.
12a. Leaves heavily wrinkled, erect ————Mo. 7Ra
12b. Leaves not heavily wrinkled, midrect.
13a. Leaves midwide ————K 8
13b. Leaves narrow ————Ky. 56

4b. Tassel branches not forming 20-70 degree angle with central spike.
5a. Tassel branches horizontal or nearly so.
6a. Styles red; stigmas red; leaves very wide ———Ky. 58
6b. Styles green; stigmas green; tips of glumes red; leaves midwide.
7a. Plants short to midtall; leaves nonwavy, V-shaped ——K 41
7b. Plants tall; leaves midwavy, not V-shaped ————USDA 41

5b. Tassel branches forming less than 20 degree angle with central spike.
6a. Central spike and tassel branches drooping; styles green; plants late.
7a. Stigmas red; leaves heavily wrinkled.
8a. Anthers red; tips of glumes red; plants tall ———Ky. 39
8b. Anthers yellow; tips of glumes green; plants midtall ————La. 44
7b. Stigmas green; leaves not heavily wrinkled.
8a. Plants tall; leaves dark green, V-shaped ———Fla. 2
8b. Plants short; leaves greenish yellow, revolute ————Ky. 11B
6b. Central spike and tassel branches erect or nearly so.
7a. Anthers purple.
8a. Tassel branches about 15 in number; tips of glumes green; plants short, very early; leaves midcreased lengthwise ————Minn. C19
8b. Tassel branches 24 or more in number; tips of glumes red; plants very tall.
9a. Plants late; stigmas green; leaves erect ————Fla. 3
9b. Plants midseason; stigmas red; leaves midrect ———Ky. 132
7b. Anthers mostly yellowish green.
8a. Styles red; stigmas red; plants tall.
9a. Leaves not V-shaped; plants very late ————La. 5
9b. Leaves V-shaped; plants midseason-late ————Tex. 158-4
8b. Styles green.
9a. Stigmas red; plants late to very late.
10a. Plants very tall; leaves midwavy, rigid, erect ———La. 87
10b. Plants midtall; leaves wavy, semirigid, midrect.
11a. Leaves midwavy, not V-shaped ————Ky. 89
11b. Leaves heavily wrinkled, V-shaped ————Ky. 36
9b. Stigmas green.
10a. Plants early to very early.
11a. Plants midtall, early; leaves dark green; tips of glumes red ————Ind H22
11b. Plants short, very early; leaves midgreen; tips of glumes green ————Minn. C16
10b. Plants midseason to late.
11a. Tassel branches about 27 in number; plants tall.
12a. Leaves dark green; heavily wrinkled, erect ————La. 50
12b. Leaves midgreen, midwavy, midrect ————USDA 23
11b. Tassel branches about 15-18 in number.
12a. Plants short to midtall midseason-late ———K 10
12b. Plants midtall to tall, late.
13a. Tips of glumes red; leaves midrect., short——La. 501
13b. Tips of glumes green; leaves erect, midlong.
14a. Leaves rigid, not V-shaped, narrow; kernels midlarge ———La. 24
14b. Leaves semirigid, V-shaped, midwide; kernels small ———La. 25

1b. Seeds not white.
2a. Chaff white.
3a. Tassel branches not forming 20-70 degree angle with central spike.
4a. Tassel branches horizontal or nearly so; plants midseason.
5a. Styles red; stigmas red; leaves wavy ———USDA 5
5b. Styles green; stigmas green; leaves midwavy ———USDA 7
4b. Tassel branches forming less than 20 degree angle with central spike, erect.
5a. Base of glumes light red; tips of glumes red; leaves erect ———Ky. 35-35
5b. Base of glumes green.

6a. Tips of glumes green.
7a. Tassel branches about 5 in number; plants short, very early ———Minn. A116
7b. Tassel branches about 20 in number; plants tall, midseason-late ———K 179
6b. Tips of glumes red.
7a. One to no tassel branches; anthers red ———N.J. A64
7b. Ten or more tassel branches; anthers yellowish or purplish yellow-green.
8a. Styles red; stigmas red.
9a. Plants midseason; leaves dark green, rigid——Tenn. J3-6G
9b. Plants late; leaves light green, semirigid——USDA 1
8b. Styles green.
9a. Stigmas green; leaves dark green, erect——K 148
9b. Stigmas red or mostly so; leaves midgreen, midcrec.t.
10a. Plants especially tall, very late; leaves V-shaped, creased lengthwise, narrow; (stigmas segregating for color) ———La. 562
10b. Plants not especially tall or late; leaves not V-shaped, noncreased lengthwise; midwide.
11a. Leaves rigid ———Ky. 35-7
11b. Leaves semirigid, characteristic green ———K 167

3b. Tassel branches forming 20-70 degree angle with central spike.
4a. Tassel branches and central spike drooping; base of glumes segregating for color; plants especially tall, late ———La. 515
4b. Tassel branches and central spike erect or nearly so; base of glumes green.
5a. Styles red; stigmas red.
6a. Plants tall, very late; leaves narrow; tips of glumes red ———La. 510
6b. Plants midtoo tall, midseason; leaves wide; tips of glumes green ———K 155
5b. Styles green.
6a. Stigmas red; plants very tall, very late; leaves rigid, narrow ———La. 504
6b. Stigmas green; anthers mostly yellowish green or purplish yellow in color.

7a. Plants especially tall, very late; leaves nonrigid; tassel branches about 34 in number ————La. 548

7b. Plants not especially tall; tassel branches 25 or less in number; glume edges not brown in color.

8a. Plants very late, tall; kernels small.

9a. Leaves midgreen, nonwrinkled, noncreased lengthwise ————La. 568

9b. Leaves light green, midwrinkled, midcreased lengthwise ————La. 569

8b. Plants not especially late, mostly midtall or shorter.

9a. Plants short, early.

10a. Leaves heavily wrinkled, not V-shaped ————Minn. A142

10b. Leaves midwrinkled, V-shaped ————Minn. A340

9b. Plants mostly midtall, midearly to midlate.

10a. Tassel branches less than ten in number.

11a. Leaves wavy, rigid ————K 159

11b. Leaves midwavy, semirigid ————Ohio 40B

10b. Tassel branches 14-25 in number.

11a. Leaves light green; kernels light pinkish yellow, small ————(K 153(YS)

11b. Leaves midgreen to darker; kernels midlarge to larger.

12a. Leaves midwavy, crect ————K 180

12b. Leaves wavy, midcrect.

13a. Leaves rigid, narrow ————K 168

13b. Leaves semirigid, midwide ————K 151

2b. Chaff not white.

3a. Base of glumes red or mostly so (except Wisc. CC24).

4a. Tassel branches forming a 20-70 degree angle with central spike, crect.

5a. Tassel branches about 19-25 in number.

6a. Edges of glumes not brown; plants late, tall ————K 201A

6b. Edges of glumes brown; plants short, midseason ————K 226

5b. Tassel branches about 9-15 in number; plants short; styles green.

6a. Stigmas red; edges of glumes brown; tips of glumes mostly red; leaves heavily wrinkled.

7a. Plants very early; leaves creased lengthwise, midwide; tassel branches about 9 in number ————Conn. 14

7b. Plants midseason; leaves midcreased lengthwise, wide; tassel branches about 12-15 in number;

(plants segregating for color of base of glume) — Wisc. CC24

6b. Stigmas green.

7a. Edges of glumes not brown; leaves wavy ————Ohio 28

7b. Edges of glumes brown; leaves midwavy.

8a. Leaves heavily wrinkled, V-shaped, narrow ————Wisc. CC2

8b. Leaves midwrinkled, not V-shaped, midwide ————Wisc. CC6

4b. Tassel branches not forming 20-70 degree angle with central spike, mostly less than 17 in number; edges of glumes brown; styles green.

5a. Tassel branches horizontal or nearly so, 6-7 in number; plants very short, very early; leaves creased lengthwise.
6a. Tassel branches drooping; leaves light green ---- Wisc. M50
6b. Tassel branches not drooping; leaves midgreen ---- Minn. C14
5b. Tassel branches forming less than 20 degree angle with central spike.
6a. Tassel branches drooping; base of glume light red--Nebr. N6
6b. Tassel branches erect or nearly so.
7a. Tassel branches about five in number; anthers purple ------------------------ Ohio 26
7b. Tassel branches about five in number; anthers yellow or purplish yellow.
8a. Plants very short, very low-cared; leaves dark green --------------------- Ohio 65
8b. Plants short to midtall; leaves midgreen ---- Mo. 557
3b. Base of glumes not red or purple.
4a. Tassel branches not forming 20-70 degree angle with central spike; edges of glumes brown.
5a. Tassel branches horizontal or nearly so.
6a. Styles light red; stigmas red; anthers red; leaves crook ------------------- Iowa 234
7a. Tassel branches more than 15 in number; plants midtall.
8a. Tassel branches about 25 in number; plants late; leaves midwavy, noncreased lengthwise ------- K 221 (K4)
8b. Tassel branches about 15 in number; plants midseason; leaves wavy; creased lengthwise------ Ohio 56
7b. Tassel branches about 4 or 8 in number.
8a. Tassel branches about 4 in number; stigmas red--Iowa 197
8b. Tassel branches about 8 in number; stigmas green.
9a. Plants very early, short; leaves nonwrinkled; light green ---------------------- Minn. A158
9b. Plants midseason, midtall to tall; leaves heavily wrinkled, dark green ------------- N.J. A47
5b. Tassel branches forming less than 20 degree angle with central spike.
6a. Tassel branches and central spike drooping; plants short.
7a. Tassel straw colored; plants very early; leaves midgreen ---------------------- Minn. A131
7b. Tassel not straw colored; plants midseason; leaves dark green ------------------ N.J. A12
6b. Tassel branches erect or nearly so.
7a. Tassel branches less than 12 in number.
8a. Tassel branches 10-12 in number; leaves dark green, short, creased lengthwise.
9a. Plants very short; styles red; stigmas red; leaves semirigid ------------------- Iowa 153
9b. Plants short; styles and stigmas segregating for color; leaves rigid ---------------- Minn. A344
8b. Tassel branches about five in number.
9a. Anthers purple; tips of glumes red ---------------------- Iowa 426
9b. Anthers yellowish; tips of glumes green ---- Conn. 243
7b. Tassel branches 15 or more in number.
8a. Plants early.
9a. Tassel branches about 40 in number; anthers yellow ---------------------------------------Iowa 447
9b. Tassel branches about 15-16 in number; anthers not yellow; tips of glumes red.
10a. Anthers purple; plants midtall; leaves long, midwido -----------------------------------Ind. 66
10b. Anthers brick red; plants short; leaves midlong, narrow -----------------------------------Minn. A322
3b. Plants midseason; anthers yellow or yellowish purple; stigmas green.
9a. Plants midtall; leaves light green; kernels large ------------------------------------------Ill. 5673
9b. Plants short-midtall; leaves midgreen; kernels small to small-midlarge.
10a. Leaves wavy, erect ----------------------------------------Ind. Fc
10b. Leaves midway, ridged -----------------------------------Ohio 67

4b. Tassel branches forming 20-70 degree angle with central spike.
5a. Tassel branches drooping; edges of glumes brown.
6a. Anthers purple; tips of glumes red; styles green.
7a. Stigmas green.
8a. Tassel branches about 24 in number; plants midseason, short; leaves rigid, short ------------Ill. 90
8b. Tassel branches about 15 in number; plants very early, midtall; leaves semirigid, long -------Mich. 1459
7b. Stigmas red; leaves long; tassel branches 26 or 33 in number.
8a. Leaves wavy; kernels reddish orange ----------------------------------------Ind. Tr
8b. Leaves midway; kernels yellow --------------------------------------Minn. A11
6b. Anthers not purple.
7a. Styles red; stigmas red.
8a. Plants midseason, midtall; culms zigzag; characteristic greenish, yellowish purple anthers; tips of glumes red ----------------------------------------K 126
8b. Plants very early; anthers yellowish green.
9a. Leaves nonwavy, midgreen; kernels orange --------------------------------------Minn. C11
9b. Leaves midway, light green; kernels yellow ----Misc. G03
7b. Styles green.
8a. Stigmas red; tassel branches 13-14 in number.
9a. Tassel straw-colored; leaves crossed lengthwise-Minn. A28
9b. Tassel not straw-colored; tips of glumes green; leaves mid- or noncrossed lengthwise.
10a. Plants short; leaves narrow ----------------------------------------Minn. A347
10b. Plants midtall; leaves midway -----------------------------------Ohio 33
8b. Stigmas green.
9a. Tassel branches about 15-20 in number.
10a. Plants midseason.
11a. Plants tall; leaves wavy, nonrigid, wide, long ------------------------------------------K 214
11b. Plants short; leaves midway, midrigid, midwide, midlong ------Misc. G07
10b. Plants early.
11a. Plants midtall; leaves heavily wrinkled, V-shaped --------------------------------------Minn. A71
11b. Plants short; leaves midwrinkled, not V-shaped.
12a. Leaves midgreen, nonwavy, nonrigid-------Minn. A7
12b. Leaves dark green, midway, semirigid------Minn. A334
9b. Tassel branches less than 14 in number.
10a. Tassel branches about 3 in number; leaves heavily wrinkled ——— USDA 4-8
10b. Tassel branches about 9-14 in number.
11a. Plants midtall to tall, midseason; tips of glumes red.
12a. Leaves heavily wrinkled, midgreen, semirigid, miderect ——— Iowa 239
12b. Leaves nonwrinkled, dark green, nonrigid, erect.
13a. Leaves midwavy ——— Iowa 317
13b. Leaves nonwavy ——— Minn. L3
11b. Plants short to short-midtall, very early to early-midseason; tips of glumes green.
12a. Plants short.
13a. Tassel straw-colored; plants very early; leaves nonwrinkled ——— Minn. A155
13b. Tassel not straw-colored; plants early; leaves heavily wrinkled ——— N. J. B42
12b. Plants short-midtall.
13a. Leaves heavily wrinkled, rigid, erect, creased lengthwise ——— N. J. A30
13b. Leaves midwrinkled, semirigid, miderect, midcreased lengthwise.
14a. Leaves midgreen, wide ——— Ind. WF9
14b. Leaves shiny almost dark green, midwide ——— Iowa 205

5b. Tassel branches erect; styles green (except Iowa 456 and Ohio 51).
6a. Stigmas red; edges of glumes brown.
7a. Anthers purple; tips of glumes red in color.
8a. Plants late, midtall; tassel branches about 24 in number; leaves a characteristic whitish-green ——— Mo. G
8b. Plants early; tassel branches 14 or 6 in number.
9a. Tassel branches 14 in number; plants midtall; leaves rigid, light green, nonwrinkled ——— Ill. Hy
9b. Tassel branches 6 in number; plants short; leaves semirigid.
10a. Leaves dark green, heavily wrinkled, creased lengthwise ——— Ind. H5
10b. Leaves midgreen, midwrinkled, midcreased lengthwise ——— Minn. A375
7b. Anthers yellowish green.
8a. Tassel branches 12-17 in number; leaves dark green.
9a. Tips of glumes red; plants late, midtall; culms zigzag; leaves heavily wrinkled, rigid, erect, noncreased lengthwise ——— USDA 3
9b. Tips of glumes green; plants early, short; leaves midgreen, semirigid, miderect, creased lengthwise ——— Minn. A94
8b. Tassel branches mostly 10 or less in number.
9a. Tassel branches about 3 in number, leaves erect, rigid ——— Iowa 224
9b. Tassel branches about 6 or 10 in number; leaves miderect.
10a. Tassel branches 6 in number; plants very early; leaves midgreen, midcreased lengthwise, nonwrinkled ——— Wisc. C94
10b. Tassel branches about 10 in number; plants early to midseason; leaves dark green, crossed lengthwise, heavily wrinkled.

11a. Leaves rigid

11b. Leaves semirigid

6b. Stigmas green.

7a. Anthers brick red or purple; edges of glumes brown; tips of glumes red.

8a. Anthers brick red; tassel branches about 30 in number

3b. Anthers purple.

9a. Tassel branches about 10 in number; plants short, early; leaves heavily wrinkled, dark green

9b. Tassel branches about 24-27 in number; leaves not heavily wrinkled, midgreen.

10a. Plants midseason, midcall; leaves midwavy, crossed lengthwise

10b. Plants late, tall; leaves striped, wavy, mid-crossed lengthwise

7b. Anthers not red or purple.

8a. Tassel straw colored; plants very early, very short; leaves narrow, short

8b. Tassel not straw-colored.

9a. Edges of glumes not colored differently from glumes (except No. R136 and Ohio 07 which are segregating).

10a. Tips of glumes red in color.

11a. Tassel branches about 9 in number; leaves heavily wrinkled, wavy

11b. Tassel branches 14 or 20 in number; leaves long, not heavily wrinkled, midwavy.

12a. Leaves semirigid, midgreen

12b. Leaves rigid, light to midgreen

10b. Tips of glumes green; plants midseason.

11a. Tassel branches 22-24 in number; leaves rigid, midgreen.

12a. Leaves midwavy, erect

12b. Leaves wavy, midcrook

11b. Tassel branches about 16 in number; leaves semirigid, dark green.

12a. Leaves heavily wrinkled, wavy

12b. Leaves midwrinkled, midwavy

9b. Edges of glumes brown.

10a. Anthers short; tips of glumes red; plants early; leaves heavily wrinkled, rigid, revolute, crossed lengthwise

10b. Anthers not short in length.

11a. Plants short, very to early.

12a. Tassel branches 6-7 or 10 in number; tips of glumes green.

13a. Tassel branches about 10 in number.

14a. Leaves heavily wrinkled, crossed lengthwise, not V-shaped

14b. Leaves non-wrinkled, noncrossed lengthwise, V-shaped

13b. Tassel branches about 6-7 in number.

14a. Leaves heavily wrinkled, nonrigid

14b. Leaves midwrinkled, semirigid.
12b. Tassel branches 13–15 in number.
13a. Tips of glumes red
13b. Tips of glumes green.
14a. Plants very early; leaves nonwrinkled, short; culms small
14b. Plants early.
15a. Leaves midwrinkled, creased lengthwise
15b. Leaves heavily wrinkled.
16a. Leaves midcreased lengthwise, wide; culms large
16b. Leaves creased lengthwise, midwide; culms midlarge

11b. Plants not short.
12a. Tassel branches less than 12 in number.
13a. Tips of glumes green on all the glumes.
14a. Leaves midwrinkled, midgreen, midwavy, midcreased lengthwise (segregating for stigma color & style color)—Iowa 456
14b. Leaves wrinkled, dark green, wavy, creased lengthwise
13b. Tips of glumes red or red and green.
14a. Leaves heavily wrinkled.
15a. Leaves semirigid; plants vigorous
15b. Leaves rigid; plants weak.
16a. Leaves erect, midlong
16b. Leaves miderect, short
14b. Leaves not heavily wrinkled.
15a. Leaves rigid, long, narrow—USDA 2
15b. Leaves semirigid, midlong, midwide.
16a. Tassel branches about 5 in number; kernels reddish—USDA 137-2
16b. Tassel branches about 10 in number; kernels yellow—USDA 420

12b. Tassel branches 13 or more in number.
13a. Plants late, tall; leaves erect, heavily wrinkled; tips of glumes red—Tex. 132A
13b. Plants mostly midtall, early to midseason.
14a. Leaves heavily wrinkled.
15a. Leaves semirigid; plants vigorous—Ind. B2
15b. Leaves rigid; plants weak.
16a. Leaves erect, midlong—Iowa 159
16b. Leaves miderect, short—Iowa 345
14b. Leaves not heavily wrinkled.
15a. Leaves rigid, long, narrow—Ind. B2
15b. Leaves semirigid, midlong, midwide.
16a. Tassel branches about 5 in number; kernels reddish—Iowa 349
16b. Tassel branches about 10 in number; kernels yellow—Iowa 420

12b. Tassel branches 13 or more in number.
13a. Plants late, tall; leaves erect, heavily wrinkled; tips of glumes red—Tex. 132A
13b. Plants mostly midtall, early to midseason.
14a. Leaves heavily wrinkled.
15a. Leaves rigid, midcreased lengthwise; considerable amount of purple in leaves and midribs—Iowa 159L1
15b. Leaves semirigid, creased lengthwise—Ill. 5120
14b. Leaves not heavily wrinkled.
15a. Leaves dark green, wide—Ill. L
15b. Leaves midgreen.
16a. Leaves creased lengthwise.
17a. Leaves semirigid—Minn. B164
17b. Leaves nonrigid.
18a. Leaves midwavy, revolute—Wisc. C01
18b. Leaves nonwavy, flat or nearly so—Wisc. C05
16b. Leaves midcreased or noncreased lengthwise.
17a. Leaves V-shaped (styles greenish pink)—Ohio 51
17b. Leaves not V-shaped.
18a. Leaves wide, midlong; culms large—Iowa P
13b. Leaves midwide.
19a. Leaves long—Ohio 401
19b. Leaves midlong—Ohio 51A