

OBJECTIVE DESCRIPTION OF VARIETY

Asparagus (*Asparagus officinalis* L.)

INSTRUCTIONS

Please read instructions carefully before completing the attached form. The Objective Description Form is a necessary part of an application for Plant Variety Protection (Breeder's Rights) in the United States of America. It is designed to guide the applicant in describing an asparagus variety in detail so that comparisons with other asparagus varieties may be done in a meaningful way. To aid in this goal, data collectors and breeders from different locations should collect the data in a similar fashion. These instructions describe the way in which to take each measurement needed to complete this form. It is possible that some traits are unobtainable for a certain variety or type of asparagus, causing some blanks to be left empty. It is in your best interest to describe your application variety as completely as possible to establish an adequate variety description. This description is used to describe the variety **AND** to establish the distinctness of the variety from all varieties of prior existence. Undescribed traits are considered to match the descriptions of **all** prior varieties and, therefore, do not constitute a difference. That is, if you do not describe the maturity of the application variety, then maturity cannot be used to differentiate the application variety from all prior varieties, no matter how early or late they are, and the number of varieties that are a bar to protection is increased because maturity could not be used to eliminate any of them from consideration.

The applicant's name and complete address should be at the top of the form. The name of the applicant must match the name given in all other parts of the application (the terms "owner" and "applicant" are used interchangeably). The name of the application variety is also entered at the top of the form. The Plant Variety Protection Office will assign a unique PVP Number to each application and enter it below the variety name.

Choose ONE most similar comparison variety to compare with your application variety throughout the Objective Description Form. The comparison variety that you choose should be the most similar one in terms of morphology, background, genetics, and maturity. Marker-assisted selection may help to identify the most similar variety or varieties. The clarity of the complete application will improve if the variety used to complete the Objective Description Form is also one of the varieties used in the Exhibit B to describe the distinctness of the application variety. (Note that the objective description of other varieties used in Exhibit B may be required in order to complete the examination of the application.)

Please follow the Guidelines for Conduct of Tests as described in the most recent version of UPOV Test Guideline TG/130. NOTE: This publication can be accessed at http://www.upov.int/en/publications/tg_rom/tg_index.html (look for "asparagus" on the list). There are also excellent pictures to help understand how to measure some of the data. Some traits were pulled from U.S. patents #PP18409 and #PP18387, and thus represent typical U.S. botanical descriptions of asparagus varieties.

In general, for this form, observations and measurements of quantitative traits should be taken **in the second or third year in one place on 40 randomly selected plants or plant parts** to obtain averages and statistics that describe a typical field of the variety. Trials should be done preferably in one location, with replicates, in the region of best adaptability (where the variety will grow and perform to its best potential). Trials should include the application variety plus all comparison varieties. At least one year of trials should be conducted within the United States of America. (Please note that to complete the examination process and to establish the distinctness of the application variety, the trial protocol needs to be performed in 2-3 years. In cases where a shortened time period (one year) is desired, you may substitute 2-3 distinct geographical locations within the region of best adaptability, with replicates in each location. See the notes about Exhibit B claims at the end of these instructions.)

For each of the measurable traits, **report the number of plants measured and the standard deviation.**

$$\text{StandardDeviation} = \sqrt{\frac{\sum (X - \bar{X})^2}{(N - 1)}}$$

If a picture would be helpful to support claims for differences, the symbol  is listed beside the instruction for that trait.

1. MATURITY

- Name the variety to be used for comparisons. **Describe the comparison variety in the right-hand column for all traits on form.**
- Report the maturity of emergence of spears.
- Report the maturity of beginning of flowering.

2. PLANT

- Choose the chromosome ploidy that describes the variety.
- Report the sex expression. The UPOV form provides diagrams to explain the difference between the flower types.
- Measure the number of stems on the plant at the end of the growing season. Use plants from which no harvesting was done prior to measurement.

3. STEM

GENERAL:

- Report the height class of the variety (compared to all varieties of asparagus). 
- Report the diameter class of the variety (compared the all varieties of asparagus). 

FEMALE PLANT and MALE PLANT:

- 1. Measure the stem diameter at ground level.
- 2. Measure the maximum stem length. The UPOV form has a diagram to help explain how to take this measurement. NOTE: this measurement should equal the sum of measurements #3, #4, and #5.
- 3. Measure the length from the ground to the first ramification (branch). The UPOV form has a diagram to help explain how to take this measurement.
- 4. Measure the length from the first to the last ramification (branch).
- 5. Measure the length of the stem beyond the last ramification (branch).
- 6. Measure the number of nodes below the first ramification (branch).
- 7. Measure the number of ramifications (branches) (=nodes).
- 8. Measure the number of nodes above the last ramification (branch).
- 9. Calculate the internode length between the first and last ramifications using the formula: Measurement 4 + (Measurement 7 - 1)
- 10. Calculate the internode length above the last ramification using the formula: Measurement 5 + (Measurement 8 - 1)
- 11. Calculate the stalk vigor index using the formula Stalk Number X Stalk Diameter X Stalk Diameter
- 12. Report the mature stem color below the first ramification (branch). Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. 
- 13. Report the mature stem color between the first and last ramifications (branches). Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. 
- 12. Report the mature stem color beyond the last ramification (branch). Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. 
- 12. Report the typical and observed ramification (branch) color. Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. 

Asparagus (*Asparagus officinalis* L.)
INSTRUCTIONS (CONTINUED)

4. SPEAR

- Report the intensity of the anthocyanin on the apex of the spear. ■
- Report the intensity of the chlorophyll of the apex. ■
- Report the shape of the apex. ■
- Report the comparison of the diameter of the base of the apex with the diameter of the rest of the stem. ■
- Report the attitude of the bracts. ■
- Measure the length of the first bracts at the base of the apex.
- Measure the width of the first bracts at the base of the apex.

5. FLOWERS

- Report the color of the tip of the petal. Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. ■
- Report the color of the base of the petal. Give both a verbal color name, such as yellow, and a color chart reference that matches the shade of the color that you observe. Suggested color charts include the Munsell Book of Color and the Royal Horticultural Colour Chart. ■
- Measure the length of the flower.
- Measure the width of the flower.
- Describe the bracts subtending the inflorescence branches, the tepals, the stamens, the filaments, the anthers, and the gynoecium. U.S. patents #PP18409 and #PP18387 give examples of some features to be described, some terms that are appropriate, and a reasonable level of thoroughness.
- Measure the number of flowers per cluster (per flowering node). (The standard deviation and sample size need not be reported for this trait.)

6. PHYLLOCLADES and FOLIAGE

- Report the density of phylloclades on the first non-branched side shoot. The UPOV form has diagrams to help judge this trait. ■
- Report the intensity of the green color of the foliage. ■
- Measure the number of phylloclades per node.
- Measure the length of the phylloclades.
- Measure the width of the phylloclades.
- Describe the phylloclade shape and the leaves. U.S. patents #PP18409 and #PP18387 give examples of some features to be described, some terms that are appropriate, and a reasonable level of thoroughness.

7. FRUIT and SEEDS

- Measure the weight of 100 fruits.
- Measure the water displacement of 100 fruits.
- Measure the number of seeds per 100 fruits.
- Measure the water displacement of the seeds of 100 fruits.
- Measure the weight of 1000 seeds taken from an unsized sample.

8. DISEASE REACTION

- Rate the variety on a scale of 1 (most susceptible) to 9 (most resistant) for each disease reaction being reported.

9. COMMENTS

- Report any additional traits about the variety, the trial set-up, molecular marker data, etc. Include pictures or diagrams of the plants.

NOTES for Exhibit B claims for distinctness

The objective descriptions of varieties used in Exhibit B will be required in order to complete the examination of the application. Please be prepared to provide this descriptive data.

The comparison variety (or varieties) used to establish distinctness should be grown in field trials with the application variety in one location, with replicates in each year, for 2-3 years **in the region of best adaptability** (where the variety will grow and perform to its best potential). In cases where a shortened time period (one year) is desired, you may substitute 2-3 distinct geographical locations within the region of best adaptability, with replicates in each location. The varietal and environmental data collected should remain available for an additional 3 years to resolve any questions concerning comparisons or descriptions of varieties.

In order to establish distinctness based on quantitative data, quantitative differences from 2-3 different trials need to be reported and analyzed separately.

If the color of plants, stems, flowers, or other plant parts are being used to establish distinctness, list the color name and the color chart reference code also. Color names are to be used, along with the Color Chart color codes, when claiming differences based on a color trait of the variety. This will continue to be necessary to establish distinctness based on a color trait.

Pictures of both varieties being compared may be required to support your claims. Please be prepared to provide such photographs.

REPRODUCE LOCALLY. Include form number and date on all reproductions.

Form Approved OMB NO 0581-0055

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**U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705**

EXHIBIT C

**OBJECTIVE DESCRIPTION OF VARIETY
ASPARAGUS (*Asparagus officinalis* L.)**

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
ADDRESS (Street and No. or RD No., City, State, Zip Code, and Country)		FOR OFFICIAL USE ONLY PVPO NUMBER

Please read all instructions carefully.
In the spaces on the left, enter the appropriate numbers that describe the characteristics of the application variety. Any other characteristics should be recorded in the Comments Section, and continued in Exhibit D, to help establish uniqueness. On the right, enter the appropriate numbers that describe the characteristics of the most similar comparison variety. Right justify whole numbers by adding leading zeros if necessary.

The comparison variety that you choose should be the most similar one in terms of morphology, background, genetics, and maturity. Marker-assisted selection may help to identify the most similar variety or varieties.

In general, **for this form**, observations and measurements of quantitative traits should be taken in **the second or third year in one location on 40 or more randomly selected plants or plant parts** to obtain averages and statistics that describe a typical field of the variety. Trials should be done preferably in one location, with replicates, in the region of best adaptability (where the variety will grow and perform to its best potential). Trials should include the application variety plus all comparison varieties. At least one year of trials should be conducted within the United States of America. (Please note that to complete the examination process and to establish the distinctness of the application variety, the trial protocol needs to be performed in 2-3 years. In cases where a shortened time period (one year) is desired, you may substitute 2-3 distinct geographical locations within the region of best adaptability, with replicates in each location.) (Form technical content created June 2009.)

Give test area _____ conditions _____

<p>1. MATURITY</p> <p>___ Time of Beginning of Emergence of Spears (30% of plants with at least 1 spear emerged): 1=Very Early 3=Early 5=Medium 7=Late 9=Very Late</p> <p>___ Time of Beginning of Flowering (30% plants with at least one flower open): 1=Very Early 3=Early 5=Medium 7=Late 9=Very Late</p>	<p>COMPARISON VARIETY _____</p> <p>___ Beginning of Spear Emergence</p> <p>___ Beginning of Flowering</p>
<p>2. PLANT (at end of growing season)</p> <p>___ Ploidy: 1=Haploid 2=Diploid 3=Triploid 4=Tetraploid 5=Other (specify _____)</p> <p>___ Sex Expression: 1=Only plants with Female Flowers 2=Plants with Female and Male Flowers 3=Plants with Both Male Flowers and Male Flowers with Styles 4=Plants with Only Male Flowers with Styles 5=Plants with Only Male Flowers without Styles (or Style Rudiments)</p> <p>___ Number of Stems (from non-harvested plants) Standard Deviation _____ Sample Size _____</p>	<p>___ Ploidy</p> <p>___ Sex Expression</p> <p>___ Number of Stems Standard Deviation _____ Sample Size _____</p>

Application Variety	Most Similar Comparison Variety
<p>3. STEM (use the longest stem on plants)</p> <p>General:</p> <p>___ Height Class: 1=Very Short 2=Short 3=Medium 4=Tall 5=Very Tall</p> <p>___ Diameter Class: 1=Very Thin 2=Thin 3=Medium 4=Thick 5=Very Thick</p> <p>Stem on Female Plants:</p> <p>___ mm Largest Stem Diameter at Ground Level on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ cm Maximum Stem Length (fully extended) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ cm Length From Ground up to First Ramification (branch) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ cm Between First and Last Ramifications (branches) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ cm Length Beyond Last Ramification (branch) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ Number of Nodes below First Ramification (branch) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ Number of Ramifications (branches) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ Number of Nodes Beyond the Last Ramification (branch) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Internode Length Between Ramifications (branches) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Internode Length Beyond the Last Ramification (branch) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ Stalk Vigor Index (=Stalk Number X (Stalk Diameter)²) on Female Plant Standard Deviation _____ Sample Size _____</p> <p>Mature Stem Color of Female Plant below First Ramification, bloom removed: (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Mature Stem Color of Female Plant between First and Last Ramifications, bloom removed: (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Mature Stem Color of Female Plant beyond the Last Ramification, bloom removed: (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Ramification (branch) Color of Female Plant: (verbal) _____ Color Chart Name _____ Color Chart Value _____</p>	<p>General:</p> <p>___ Height Class</p> <p>___ Diameter Class</p> <p>Stem on Female Plants:</p> <p>___ mm Stem Diameter at Ground Level Standard Deviation _____ Sample Size _____</p> <p>___ cm Maximum Stem Length Standard Deviation _____ Sample Size _____</p> <p>___ cm Length From Ground to First Ramification Standard Deviation _____ Sample Size _____</p> <p>___ cm Between First and Last Ramifications Standard Deviation _____ Sample Size _____</p> <p>___ cm Length Beyond Last Ramification Standard Deviation _____ Sample Size _____</p> <p>___ Number of Nodes below First Ramification Standard Deviation _____ Sample Size _____</p> <p>___ Number of Ramifications on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ Number of Nodes Beyond the Last Ramification Standard Deviation _____ Sample Size _____</p> <p>___ mm Internode Length Between Ramifications Standard Deviation _____ Sample Size _____</p> <p>___ mm Internode Length Beyond Last Ramification Standard Deviation _____ Sample Size _____</p> <p>___ Stalk Vigor Index Standard Deviation _____ Sample Size _____</p> <p>Mature Stem Color below First Ramification (verbal) _____ Color Chart Value _____</p> <p>Mature Stem Color between First and Last Ramifications (verbal) _____ Color Chart Value _____</p> <p>Mature Stem Color beyond Last Ramification (verbal) _____ Color Chart Value _____</p> <p>Ramification Color (verbal) _____ Color Chart Value _____</p>

Application Variety	Most Similar Comparison Variety
<p>4. SPEAR (unless otherwise indicated, make all observations on spear after emergence)</p> <p>___ Anthocyanin Coloration of Apex (at emergence): 1=Absent 3=Weak 5=Medium 7=Strong 9=Very Strong</p> <p>___ Intensity of Chlorophyll Coloration of Apex After Emergence (about 5-10 cm above soil surface): 1=Absent to Very Weak 3=Weak 5=Medium 7=Strong 9=Very Strong</p> <p>___ Shape of Apex: 1=Very Narrow 3=Narrow Triangular 5=Triangular 7=Broad Triangular 9=Very Broad</p> <p>___ Diameter of Base of Apex compared to Remaining Stem: 1=Much Smaller 3=Smaller 5=Equal 7=Larger 9=Much Larger</p> <p>___ Attitude of Bracts: 1=Adpressed 2=Slightly Held Out 3=Markedly Held Out</p> <p>___ mm Length of First Bracts at base of Apex at harvest time Standard Deviation _____ Sample Size _____</p> <p>___ mm Width of First Bracts at Base of Apex at harvest time Standard Deviation _____ Sample Size _____</p>	<p>___ Anthocyanin of Apex</p> <p>___ Chlorophyll of Apex</p> <p>___ Shape of Apex</p> <p>___ Diameter of Base of Apex</p> <p>___ Attitude of Bracts</p> <p>___ mm Length of 1st Bracts Standard Deviation _____ Sample Size _____</p> <p>___ mm Width of 1st Bracts Standard Deviation _____ Sample Size _____</p>
<p>5. FLOWERS</p> <p>Petal Tip Color on Female Plant (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Petal Tip Color on Male Plant (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Petal Base Color on Female Plant (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>Petal Base Color on Male Plant (verbal) _____ Color Chart Name _____ Color Chart Value _____</p> <p>___ mm Flower Length on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Length on Male Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Width at midpoint on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Width at midpoint on Male Plant Standard Deviation _____ Sample Size _____</p> <p>Describe Bracts subtending inflorescence branches: _____ _____ _____</p> <p>Describe Tepals: _____ _____ _____</p> <p>Describe Stamens: _____ _____ _____</p> <p>Describe Filaments: _____ _____ _____</p> <p>Describe Anthers: _____ _____ _____</p> <p>Describe Gynoecium: _____ _____ _____</p> <p>___ Number of Flowers per Cluster (flowering node)</p>	<p>Petal Tip Color on Female Plant _____ Color Chart Value _____</p> <p>Petal Tip Color on Male Plant _____ Color Chart Value _____</p> <p>Petal Base Color on Female Plant _____ Color Chart Value _____</p> <p>Petal Base Color on Male Plant _____ Color Chart Value _____</p> <p>___ mm Flower Length on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Length on Male Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Width on Female Plant Standard Deviation _____ Sample Size _____</p> <p>___ mm Flower Width on Male Plant Standard Deviation _____ Sample Size _____</p> <p>Describe Bracts subtending inflorescence branches: _____ _____ _____</p> <p>Describe Tepals: _____ _____ _____</p> <p>Describe Stamens: _____ _____ _____</p> <p>Describe Filaments: _____ _____ _____</p> <p>Describe TAnthers: _____ _____ _____</p> <p>Describe Gynoecium: _____ _____ _____</p> <p>___ Number of Flowers per Cluster (flowering node)</p>

Application Variety	Most Similar Comparison Variety
<p>7. FRUIT and SEEDS</p> <p>_____ gm Weight per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mL Water Displacement of 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ Number of Seeds per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mL Water Displacement of Seeds per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mg/1000 Unsized Seeds Standard Deviation _____ Sample Size _____</p>	<p>_____ gm Weight per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mL Water Displacement of 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ Number of Seeds per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mL Water Displacement of Seeds per 100 Fruits Standard Deviation _____ Sample Size _____</p> <p>_____ mg/1000 Unsized Seeds Standard Deviation _____ Sample Size _____</p>
<p>8. DISEASE RESISTANCE (1=Strongly Susceptible; 5=Intermediate; 9=Highly resistant)</p> <p>___ Asparagus Rust (<i>Puccinia asparagi</i>)</p> <p>___ Fusarium crown rot (<i>Fusarium moniliforme</i>)</p> <p>___ Fusarium root rot (<i>Fusarium oxysporum</i>)</p> <p>___ Asparagus Latent Virus</p> <p>___ Anthracnose (<i>Colletotrichum gloeosporioides</i>)</p> <p>___ Other _____</p>	<p>___ Asparagus Rust</p> <p>___ Fusarium crown rot</p> <p>___ Fusarium root rot</p> <p>___ Asparagus Latent Virus</p> <p>___ Anthracnose</p> <p>___ Other _____</p>
<p>9. COMMENTS (Please give additional comments which characterize the variety, describe the trial set-up, molecular marker data, etc. Include pictures and/or diagrams of the plants.) (Continue in Exhibit D.)</p>	
<p>Application Variety</p>	<p>Most Similar Comparison Variety</p>