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生态经济型沙棘品种评价规范

Code for evaluation of eco-economic seabuckthorn cultivars

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Introduction

This standard is drafted in accordance with the provisions of GB/T 1.1-2020 Standardization Work Guidelines Part 1: Rules for the structure and drafting of standardization documents.

Please note that some aspects of this standard may involve patents. The issuing authority of this standard is not responsible for the identification of patents.

This standard is compiled by the International Sea Buckthorn Association.

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1 Range

This standard specifies the terms and definitions, technical requirements, identification and evaluation methods for the evaluation of eco-economic seabuckthorn varieties.

This standard is applicable to the evaluation of seabuckthorn varieties with both ecological and economic value, mainly applicable to the evaluation of *Hippophae rhamnoides ssp sinensis* and the new hybrid varieties of *Hippophae rhamnoides ssp sinensis* and *Hippophae rhamnoides ssp mongonica*.

2 Normative reference documents

The following documents constitute the provisions of this standard by normative reference in the text.

GB/T 12295 fruit and vegetable products -- determination of soluble solid content -- Refractometer method.

3 Terms and definitions

eco-economic seabuckthorn cultivars

It has good morphological characteristics, robust growth, wide adaptability, strong ability to adapt to or resist various abiotic and biological stresses, and has large fruits, high yield and relatively rich nutrients.

4 Traits

The characters of eco-economic seabuckthorn varieties include ecological characters and economic characters.

Ecological traits mainly include crown volume, tillering ability, disease resistance/insect resistance, etc.

Economic traits mainly include fruit size, fruit yield, soluble solid content and so on.

5 Technical requirements and methods

5.1 Evaluate test materials

5.1.1 The climate of the test site should be able to meet the normal growth and development of sea buckthorn and be representative of a certain region.

5.1.2 The material to be evaluated should meet the cultivation area of more than 0.2hm2, have stable biological characteristics, and have a stable continuous yield of 3 years.

5.1.3 The test material to be evaluated shall be plants of at least 5 years of age that have been

propagated asexually.

5.2 Test Method

5.2.1 Test location

The material to be tested should be located in a production or research base that meets the requirements of the test conditions, generally focusing on the environmental conditions of arid and semi-arid regions.

5.2.2 Test Conditions

The test should be carried out under the condition that the relevant traits of the germplasm material to be tested can be fully and stably expressed, preferably at the fruit maturity stage.

5.2.4 Test methods for ecological traits

The collection of ecological character data should be carried out during the corresponding growth period under the condition of normal germplasm growth, and the field manual measurement and statistical evaluation should be carried out.

5.2.5 Test methods for economic traits

The fruit size, fruit yield and soluble solid content were evaluated by means of measuring tools and rapid measuring instruments.

6. Evaluation of ecological traits

6.1 Crown volume

The varieties to be tested in the test plot were taken as the observation objects, and 10 to 20 trees were randomly investigated. The tree height and crown width of each tree were observed. The crown volume was calculated by the following formula, and the average value was taken, and the crown volume was evaluated according to Table 1.

$$V=\frac{1}{6}\pi\overline{H}\cdot\overline{D}^2$$

Where: V is the crown volume (m3);

D is the average crown width (m);

H is the average tree height (m).

Table 1. Canopy volume evaluation criteria

No.	Crown Volume (m3)	evaluation and classification
1	3～6	Medium
2	6～9	larger
3	＞9	big

6.2 Tillering ability

Ten to 20 continuous sea buckthorn plants were selected in the test plot, the total number of sprouting plants was investigated, the area was determined, the number of sprouting plants per unit area was calculated, and the sprouting ability was determined according to Table 2.

Table 2. Evaluation criteria of tillering ability

No.	sprout ability (plant /m2)	evaluation
1	1～5	Medium
2	5～10	larger
3	＞10	big

6.3 Disease resistance/pest resistance

Disease resistance/pest resistance was determined by field statistical survey in the test plot. The premise is that the site to be assessed is free of pests and diseases, or at most one pest and disease. Seabuckthorn with multiple pests and diseases under test did not have the conditions for evaluation.

The resistance of sea buckthorn to dry shrinkage disease and leaf shrinkage disease was determined. The resistance of sea buckthorn to wood sac moth and fly was determined.

a) Dry shrinkage disease: 10 ~ 20 sea buckthorn trees to be tested were randomly investigated. If dry shrinkage disease spots appeared in the main stem or lateral branches, they were infected trees. The disease resistance was calculated using the following formula:

Disease resistance of sea Buckthorn (%) =[1- (number of infected trees/number of investigated trees)]×100%

b) Leaf shrinkage disease: 10 ~ 20 sea buckthorn trees to be tested were randomly investigated. If the top tip showed leaf rolling symptoms, the trees were infected. The calculation formula was the same as before.

c) Wood sac moth: The growth decline or near death of sea buckthorn to be measured is found, and the mixture of wood debris and insect dung is found at the base of the trunk, which can be preliminatively judged as the harm of wood sac moth. Within the range of the trunk of these trees, the soil with the length, width and depth of 50cm, 50cm and 40cm, respectively, is cut out to determine whether the root and trunk have wood sac moth. Then randomly select plants with normal growth for observation, so as to meet the investigation number of 10-20 plants, and calculate the insect resistance with the following formula:

Insect resistance of sea buckthorn (%) =[1- (number of pest plants/number of survey plants)]×100%

d) Fly around: 10 ~ 20 sea buckthorn trees to be tested were randomly investigated. If there was real fly around, it was an insect pest tree. The calculation formula was the same as before.

The levels of disease resistance/pest resistance are determined according to Table 3.

Table 3 Evaluation criteria for disease resistance/insect resistance

No.	Disease/insect resistance（%）	evaluation and classification
1	80～90	Medium
2	90～95	Larger
3	＞95	strong

In addition, if the number of trees infected with dry shrinkage disease or wood sac moth in the sample reaches 2, it can trigger 1 veto vote and not be assessed.

7. Evaluation of economic traits

7.1 Fruit Size

t the fruit maturity stage, 3 to 5 sample plants were selected, each plant was hand-picked about 500 fruits, and 100 fresh ripe fruits (including fruit stalks) were randomly selected by the "quarter method" to weigh 100 fruit weight, and then the average value of 3 to 5 sample plants was calculated. Fruit size was evaluated according to Table 4.

Table 4 Fruit size evaluation criteria of sea buckthorn

No.	Hundred-fruit weight（g）	evaluation and classification
1	10～15	Medium
2	15～20	larger
3	＞20	big
3	＞7500	高

7.2 Fruit Yield

3 to 5 Seabuckthorn plants to be evaluated were randomly selected and picked manually at the fruit maturity stage. The fruit yield per plant was measured and its average value was taken, and then the yield per unit area was calculated according to the fixed plant row spacing, that is, fruit yield = average yield per plant × number of plants per unit area, unit kg/hm2. Fruit yield was evaluated according to Table 5.

Table 5 Fruit yield evaluation criteria

No.	yield（kg/hm^2）	evaluation and classification

1	1500～4500	Medium
2	4500～7500	higher
3	＞7500	high

7.3 Soluble solid content

Select 3 to 5 sample plants, randomly pick 20 ripe fruits from each plant, squeeze the fruits, drop the extracted juice onto the hand-held refractometer, record the observation data, repeat 3 times per plant, take the average value of 3 to 5 is soluble solid content, unit %. Soluble solids were evaluated according to Table 6.

Table 6 Evaluation criteria for soluble solids

No.	Soluble solid content（%）	evaluation and classification
1	8～10	Medium
2	10～12	higher
3	＞12	high

8 Comprehensive evaluation of new ecologically economic sea buckthorn varieties

8.1 Principles of comprehensive evaluation

This standard only makes statistical analysis on the traits necessary for the identification and evaluation of new varieties of eco-economic sea buckthorn, and makes comprehensive evaluation according to the description of individual traits and evaluation criteria.

According to the description and criteria of various traits, the resource categories of breeding populations were evaluated, and the corresponding evaluation codes were determined (see Table 7). The code is composed of three digits, the first digit 1 represents the ecological character, the second digit 2 represents the economic character, and the second digit 01, 02, etc. represents the serial number of each character. All indicators are positive indicators, and the secondary indicators are divided into three levels according to the value from small to large, and the codes are Ⅰ, Ⅱ, Ⅲ in order.

Table 7 Characters, standards and code table of eco-economic seabuckthorn

No.	**Code**	**character and unit**	**standard**	**code and evaluation**
1	101	Crown volume（m^3）	1～5	Ⅰ：Medium
			5～10	Ⅱ：larger

			>10	Ⅲ：big
2	102	Tillering ability（plant/m^2）	1～5	Ⅰ：Medium
			5～10	Ⅱ：Larger
			>10	Ⅲ：strong
3	103	Disease/insect resistance（%）	80～90	Ⅰ：Medium
			90～95	Ⅱ：Larger
			>95	Ⅲ：strong
4	201	Hundred-fruit weight（g）	10～15	Ⅰ：Medium
			15～20	Ⅱ：larger
			>20	Ⅲ：big
5	202	Fruit yield（kg/hm^2）	1500～4500	Ⅰ：Medium
			4500～7500	Ⅱ：higher
			>7500	Ⅲ：high
6	203	Soluble solid content（%）	8～10	Ⅰ：Medium
			10～12	Ⅱ：higher
			>12	Ⅲ：high

8.2 Comprehensive evaluation scoring methods and standards

According to the status and importance of ecological traits and economic traits in the evaluation of new varieties of eco-economic sea buckthorn, 50% weight of ecological traits and 50% weight of economic traits were assigned according to the 100-point system. Then, according to the importance of each evaluation index in each trait, different weights and scores are assigned.

The total score of seabuckthorn varieties participating in the evaluation was obtained by calculating each secondary index (see Table 8).

Table 8 Calculation table of evaluation scores of eco-economic seabuckthorn

group	Associated character	character and unit			Evaluation score calculation				
		Ⅰ	Ⅱ	Ⅲ	*A*	b_1	b_2	*x*	*Y*
Ecological character（50%）	Crown volume（20 分）	3～6	6～9	>9	20	3	9		
	Tillering ability（10 分）	1～5	5～10	>10	10	1	10		
	Disease/insect resistance（20 分）	80～90	90～95	>95	20	80	95		
	subtotal（50 分）				50				
Economic character（50%）	Hundred-fruit weight（10 分）	10～15	15～20	>20	10	10	20		
	Fruit yield（25 分）	1500～4500	4500～7500	>7500	25	1500	7500		
	Soluble solid content（15 分）	8～10	10～12	>12	15	8	12		
	subtotal（50 分）				50				
Total points	100 分				100				

The specific scores of each secondary index are calculated by the following formula:

$$Y=\begin{cases}\frac{x-b_1}{b_2-b_1}\times A & b_1 < x \le b_2 \\ A & b_2 < x\end{cases}$$

Where: Y is the evaluation score of each secondary index;

x is the field measured value of each secondary index;

b1 and b2 are the lower and upper limits of the data range of each secondary index, which are the comprehensive results of relevant domestic experimental studies over the years.

A is the maximum assigned score of each secondary index.

The score is calculated according to the standard in Schedule 2 and compared with the standard seabuckthorn scoring table in Table 9. The total score must reach more than 75 points to be identified as an eco-economic seabuckthorn variety.

Table 9 Standard seabuckthorn evaluation score

group	Associated character	character and unit			Standard seabuckthorn	standard score
		Ⅰ	II	III		
Ecological character（50%）	Crown volume（20 分）	3～6	6～9	>9	8	16.67
	Tillering ability（10 分）	1～5	5～10	>10	8	7.78
	Disease/insect resistance（20 分）	80～90	90～95	>95	90	13.33
	subtotal（50 分）					37.78
Economic character（50%）	Hundred-fruit weight（10 分）	10～15	15～20	>20	18	8.00
	Fruit yield（25 分）	1500～4500	4500～7500	>7500	6000	18.75
	Soluble solid content（15 分）	8～10	10～12	>12	11	11.25
	subtotal（50 分）					38.00
Total points	100 分					75.78
Evaluation standard score（≥）						75