

# Exploration, Evaluation and Screening of Excellent Asparagus Germplasm Resources

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**Abstract** [ **Objectives** ] This study was conducted to solve the problem of lacking excellent germplasm resources in asparagus cultivation in China. [ **Methods** ] Twenty asparagus germplasm resources were introduced from home and abroad, and evaluated and screened from biological traits, yield, quality, disease resistance and stress resistance. [ **Results** ] Six excellent asparagus cultivars were screened out. Four cultivars, Jinguan, Feicuimingzhu, Jiyulvu3 and Potron, performed well in agronomic traits, yield, commodity quality and disease resistance, and these four varieties had strong resistance to stem wilt, so they are suitable for planting in North China. JX1502 and Jersey knight showed strong salt tolerance, and exhibited a high yield in saline-alkali soil with a soil salt content of 0.56%. indicating that they are suitable for cultivation in coastal saline-alkali areas in China. [ **Conclusions** ] This study provides a theoretical basis for the development of asparagus industry in Hebei Province.

**Key words** Asparagus; Excellent germplasm resource; Evaluation; Screening

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Asparagus, also known as Shidiaobai, is a perennial herb, the tender stems of which are mainly eaten as a vegetable. Asparagus is known as the "king of vegetables" for its rich nutritional and medicinal value<sup>[1-3]</sup>. Asparagus cultivation is widespread in China, covering an area of over 133 300 hm<sup>2</sup>. Hebei Province has an asparagus cultivation area of 10 000 hm<sup>2</sup><sup>[4]</sup>. Because the cultivated cultivars of asparagus are chaotic and their age is gradually declining, it is urgent to update the cultivars<sup>[5-7]</sup>. Therefore, this study introduced 20 new asparagus cultivars from home and abroad, and comprehensively evaluated their yield, quality and disease resistance, in order to provide basis for the development of asparagus industry in Hebei Province.

## Materials and Methods

### Experimental materials

Twenty cultivars were tested, and their names are shown in Table 1.

### Experimental methods

The experiment was conducted in the experimental field of Institute of Cash Crops, Hebei Academy of Agriculture and Forestry Sciences and the saline-alkali land experimental field in Cangzhou City, with randomized block design. It was set with three replicates. The plant and row spacing was 30 cm × 150 cm, and 30 plants were planted for each replicate of each variety. The seedlings were planted the experimental field of Institute of Cash

Crops, Hebei Academy of Agriculture and Forestry Sciences on May 28, 2022, and in the saline-alkali land experimental field in Cangzhou City on June 12, 2022. Conventional field management was adopted. The management level of various plots was the same.

**Table 1** Agronomic traits of 20 asparagus cultivars

No.	Cultivar	Plant height cm	Diameter of stalks//cm	Number of stalks	First branch height//cm
1	Grande	200	1.35	8.2	57
2	Eposs	219	1.28	9.6	59
3	European male	182	1.41	8.9	55
4	Uc157	210	1.52	11.5	58
5	Apollo	205	1.58	9.2	62
6	Taramec	208	1.48	7.8	60
7	Pacific green	187	1.57	11.1	58
8	Jinglv1	198	1.42	6.5	54
9	Pacific2000	182	1.63	6.1	63
10	Vittorio	161	1.54	8.6	57
11	Jinglv3	215	1.42	12.1	61
12	Feicuimingzhu	187	1.37	10.9	49
13	JX1502	198	1.50	10.3	55
14	Jersey knight	204	1.42	9.1	59
15	Jinggang701	174	1.56	14.9	62
16	Potron	198	1.39	14.5	65
17	Jinguan	208	1.41	10.5	49
18	T30	192	1.51	8.8	45
19	Guanjun	218	1.53	10.9	48
20	Jiyulvu3	224	1.55	11.6	68

### Investigation indexes

Each variety was harvested daily in spring (mid April to mid June) and autumn (early August to late September) to record the yield, including total yield, marketable yield, and thick spear (> 15 g). The plant height, stalk diameter and stalk number were measured in late October, and the number of plants with

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stem wilt and the degree of stem wilt were investigated. The incidence rate and disease index were calculated.

## Results and Analysis

### Comparison of agronomic traits of different asparagus cultivars

Among the 20 asparagus cultivars tested, the average plant height was between 161 and 224 cm, and Jiyulvlu3 was the highest (Table 1). The average stalk diameter was between 1.28 and 1.63 cm, and Pacific2000 showed the thickest stalks. The average number of stalks was between 6.1 and 14.9, and Jinggang701 exhibited the largest branch number of 14.9. The average height of the first branch was between 45 and 68 cm, and Jiyulvlu3 showed highest first branch, indicating that Jiyulvlu3 had better ventilation at the bottom.

**Table 2** Yield of different asparagus cultivars

No.	Cultivar	Total yield//kg/hm <sup>2</sup>	Marketable yield//kg/hm <sup>2</sup>	Mean spear weight//g	Thick spear (>15 g)//kg/hm <sup>2</sup>
1	Grande	8 358	7 954	19.5	7 045
2	Eposs	9 154	8 115	19.1	7 547
3	European male	7 547	7 012	18.5	6 457
4	Uc157	8 785	8 254	18.1	7 015
5	Apllo	7 987	7 248	19.4	6 587
6	Taramec	9 547	8 846	20.3	7 725
7	Pacific green	7 958	7 254	21.1	6 547
8	Jinglv1	8 835	8 545	18.6	7 425
9	Pacific2000	6 078	5 549	17.9	4 688
10	Vittorio	7 542	7 065	19.6	6 147
11	Jinglv3	8 796	8 475	17.8	7 127
12	Feicuimingzhu	10 678	11 025	19.8	9 541
13	JX1502	9 547	9 068	17.2	8 010
14	Jersey knight	9 074	8 469	19.5	7 265
15	Jinggang701	7 589	7 126	17.8	6 128
16	Potron	11 562	11 069	20.8	9 175
17	Jinguan	10 582	10 105	20.5	8 856
18	T30	8 014	7 485	19.5	5 987
19	Guanjun	7 952	7 280	18.9	5 878
20	Jiyulvlu3	11 475	9 854	20.7	8 578

### Comparison of disease resistance of different asparagus cultivars

In this study, the incidence of stem wilt in 20 asparagus cultivars was investigated. The results showed that the incidence was between 6.7% and 16.7%, and the disease index was between 11.5 and 24.5. The cultivars with a lower incidence rate included Potron, Grande, Jinglv3, Feicuimingzhu, Jersey knight, JX1502, Jiyulvlu3, and Jinguan. The cultivars with lower disease index included Potron, Feicuimingzhu, Jersey knight, Jiyulvlu2, Jiyulvlu3, and Jinguan. It indicated that Potron, Feicuimingzhu, Jersey knight, JX1502, Jiyulvlu3 and Jinguan had strong disease resistance.

### Comparison of salt tolerance

The salt tolerance of 20 asparagus cultivars was evaluated in saline-alkali land with a soil salt content of 0.56%. The results showed that (Table 3), the growth of asparagus was inhibited in saline-alkali soil where the soil salt content was higher than

### Comparison of economic yield of different asparagus cultivars

From Table 2, it can be seen that among the tested cultivars, Potron had the highest total yield at 11 562 kg/hm<sup>2</sup>, followed by Jiyulvlu3, Feicuimingzhu, and Jinguan, with 11 475, 210 678, and 10 582 kg/hm<sup>2</sup>, respectively. The results of marketable yield and thick spear (>15 g) were similar to total yield, and Potron, Feicuimingzhu, Jiyulvlu33 and Jinguan were also among the top performers.

There were some differences in yield distribution among cultivars in different harvest seasons. The yield of asparagus in spring was higher, accounting for more than 70% of the total output. In addition, in this study, it was found that Jiyulvlu3 had the highest rate of first-class spears, and the spears were compact, evenly colored and of good quality.

0.5%. The total yields of JX1502 and Jersey knight ranked in the top two among the 20 cultivars, with values of 5 040 and 4 874 kg/hm<sup>2</sup>, respectively. Their plant heights, stalk numbers and mean spear weights were also in the forefront, indicating that JX1502 and Jersey knight had strong salt tolerance and were suitable for cultivation in saline-alkali areas.

## Conclusions and Discussion

Twenty introduced asparagus cultivars were compared in the field, and six excellent asparagus cultivars were screened out. Four cultivars, Jinguan, Feicuimingzhu, Jiyulvlu3 and Potron, performed well in agronomic traits, yield, commodity quality and disease resistance, and these four cultivars had strong resistance to stem wilt, so they are suitable for planting in North China. JX1502 and Jersey knight showed strong salt tolerance, indicating that they

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are suitable for cultivation in coastal saline-alkali areas in China.

**Table 3 Traits of different asparagus cultivars under salt environment**

No.	Cultivar	Plant height cm	Number of stalks	Mean spear weight//g	Total yield kg/hm <sup>2</sup>
1	Grande	167	5.5	15.5	3 125
2	Eposs	175	5.1	14.2	3 875
3	European male	161	4.8	13.2	2 798
4	Uc157	174	5.3	13.7	2 875
5	Apllo	168	5.1	14.4	3 087
6	Taramec	157	5.0	14.5	3 545
7	Pacific green	157	5.5	14.1	2 985
8	Jinglv1	158	4.3	12.6	3 565
9	Pacific2000	147	6.2	13.9	2 075
10	Vittorio	149	4.6	11.6	3 541
11	Jinglv3	162	5.2	11.8	2 797
12	Feicuimingzhu	135	4.7	14.8	3 470
13	JX1502	178	5.5	16.2	5 040
14	Jersey knight	174	6.2	17.5	4 874
15	Jinggang701	154	4.1	12.8	3 580
16	Potron	137	4.9	12.8	3 568
17	Jinguan	170	4.8	14.5	3 520
18	T30	162	4.1	19.5	2 010
19	Guanjun	176	4.5	15.9	2 965
20	Jiyulv13	154	5.1	15.7	3 471

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