

# High-efficacy Salt-tolerant Dandelion Breeding and Dandelion Black Tea Research

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**Keywords:** High efficacy salt-tolerant dandelion; Breeding; Black tea research

**Abstract:** Studies have shown that plants growing under the stress of salinized soil, sea water or salt water can accumulate more nutrients and active substances, and it will have better nutritional, medicinal and economic qualities, which makes it more necessary to cultivate salt-tolerant economic plants. In this paper, salt-tolerant mutants from callus were cultured, and a new high-function dandelion variety "Binpu NO. 1" suitable for black tea was selected. In this paper, the color of high-efficiency dandelion black tea under different fermentation time were analyzed, and the best method of "Binpu NO. 1" black tea development was finally selected.

## 1. Introduction

Dandelion (The Latin name is *Taraxacum mongolicum* Hand.-Mazz) is a perennial herb of the compositae family. There are about 2000 species of genera and 70 species in China. Dandelion is not only a traditional Chinese medicine, but also has rich nutritional value. Soil salinization has become the main factor restricting agricultural development in China. How to develop saline-alkali land to increase the effective arable land area and increase crop yield has become the important tasks of agricultural research. Dandelion can detoxification, food poisoning, anti - evil swelling. Dandelion tea is rich in vitamins and minerals that strengthen the liver and lower cholesterol. Most dandelion biomass in saline environment is small and difficult to produce high yield. Large leaf dandelion is a tetraploid variant of wild dandelion, which has high nutritional value, medical value and economic value. And the biomass is large, but its salt tolerance is weak. In this study, salt-tolerant mutants were induced from callus of large leaf dandelion.

## 2. Selection of high quality dandelion

### 2.1 Quality inspection of dandelion series

#### 2.1.1 Test material

Callus with large leaf dandelion leaves as explants were treated with salt stress tolerance at different concentrations. Through the formation mutation of callus we will get the adventitious buds and roots, and then regenerated plants under salt stress of 0.4%, 0.6%, 0.8% and 1.0% were obtained.

#### 2.1.2 Test method

The reference method for total flavonoids detection was the technical specification for health food inspection and evaluation in 2003. The reference method for selenium detection is gb5009.93-2017. The reference method of chlorogenic acid is GB/ t22250-2008.

#### 2.1.3 Test results

The test results of dandelion series are shown in table 1.

According to the detection results, the selenium and chlorogenic acid content were the highest in regenerated plants with 1.0% salt. Through the comprehensive comparison between dandelion calluses screening under different salt stress at concentrations, molecular identification of salt-tolerant mutants and regeneration quality, Regenerated plants with 1.0% salt is the most

efficient variety.

In this paper, it was named "Binpu NO. 1", which has the characteristics of salt tolerance. At the same time, the optimized rooting technology increased the survival rate of dandelion in vitro culture, and the rapid propagation technology of tissue culture was truly applied in production practice.

Table 1 Nutritional composition of dandelion series

Sample	Total flavonoids (g/100g)	Selenium (µg/100g)	Chlorogenic acid (mg/100g)
Large leaf dandelion	0.45	7.6	43.7
Local wild dandelion	0.87	8.3	46.6
Regenerated plants with 0.4% salt	0.48	7.9	39.6
Regenerated plants with 0.6% salt	0.63	4.6	28.9
Regenerated plants with 0.8% salt	0.86	7.6	43.6
Regenerated plants with 1.0% salt	0.66	8.9	48.7

## 2.2 production detection of “Binpu NO. 1”

### 2.2.1 Test materials

"Binpu NO. 1" seed provided by binhai agricultural research institute, which is the subordinate body of Hebei academy of agriculture and forestry.

### 2.2.2 Test method

"Binpu NO. 1" and large leaf dandelion (local planting variety) were selected as the reference group. Seeds grow for one year under the same suitable conditions, which planted in tangshan city caofeidian NO. 2 and NO. 10 farms. The soil salt content is 0.2% to 0.45% and the density is 11000 plant/mu. Then the growth characteristics and yield characteristics of the seedlings were investigated in the field. The results are shown in table 2.

Table 2 The output of "Binpu NO. 1" and large leaf dandelion

Sample	Location	Leaf length(cm)	Leaf width(cm)	Output (kg/ mu)
Binpu NO. 1	NO. 10 farms	46.82	11.9	997.5
	NO. 2 farms	45.52	13.1	986.3
	average	46.17	12.5	991.9
Local large leaf dandelion	NO. 10 farms	42.7	11.0	790.4
	NO. 2 farms	40.3	12.0	777.6
	average	41.5	11.5	784.0

Field growth: “Binpu NO. 1” is strong growth and disease resistance, with an average leaf length 46.17cm, an average leaf width 12.5cm, and a relatively light color. Local large leaf dandelion is general growth and poor disease resistance, with an average leaf length 41.5cm, an average leaf width 11.5cm, and a relatively light dark. So, the new variety of “Binpu NO. 1” showed prosperous growth, strong disease resistance and remarkable yield increase, which is suitable for promotion in this region.

## 3. Development of nutritive dandelion black tea

A new dandelion variety "Binpu NO. 1" was used as the material to preliminarily develop the production technology of high-efficiency dandelion black tea.

### 3.1 Process flow

"Binpu NO. 1", picking, leaching, cutting, withering, rolling, fermentation, titian, drying, screening, picking, dandelion black tea.

### 3.2 Test materials

"Binpu NO. 1" picked fresh leaves and divided them into four parts of the same weight. During

the fermentation process in the fermentation box, the fermentation time was 15h, 20h, 25h and 30h, respectively. After fermentation, it is rolled, tited and dried to make dandelion black tea with 4 processes. The Numbers are H1, H2, H3 and H4 respectively.

### 3.3 Test on tea pigment at different fermentation time

#### 3.3.1 Test standard

The reference method of tea pigment was GB T 13738.2-2008 "black tea".

#### 3.3.2 Test method

1) Weigh 4 samples of dandelion black tea 0.375g each, add 150ml boiling water at the same time, and place for 5min.

2) The water solution is filtered with 0.45 microns filter membrane and UV spectrophotometer.

3) Sample inspection. Scanning the total absorption spectrum of the filtrate, it was found that absorption peaks appeared at 379nm and 375nm.

#### 3.3.3 Test results

The color intensity and pigment content were compared with the lowest total pigment absorbance, and then the relative values were calculated. Data results were obtained by cluster analysis or comparative analysis. And the data results are shown in table 3.

Table 3 The data results of tea pigment

Sample	Total pigment (%)	Black tea pigment (%)	Leaching rate (%)
H1	0.486±0.05a	0.217±0.14b	44.6±0.04c
H2	0.441±0.03b	0.233±0.16a	52.8±0.08d
H3	0.354±0.11d	0.12±0.02e	33.8±0.03a
H4	0.397±0.02c	0.146±0.42c	36.7±0.2b

According to the data results, H2 is the highest black tea pigment and leaching rate. So, the fermentation time of H2 is the most appropriate considering only black tea pigment.

### 3.4 Test on tea sensory at different fermentation time

#### 3.4.1 Test standard

The reference method for sensory evaluation was GB/T 14487-2008 "terms for sensory evaluation of tea". Sensory quality evaluation standard of dandelion black tea is shown in table 4.

Table 4 Sensory quality evaluation standard of dandelion black tea

Sample	Scoring Standards	Score
Color and luster	Bright color, red and yellow, uniform	9-10
	Dark color, lighter color, uniform	6-8
	Dark color, light color, stratified	≤5
Aroma	a strong floral and fruity aroma	9-10
	a general flower fruit fragrance	6-8
	a light floral and fruity aroma	≤5
Taste	A blend of dandelion and black tea	9-10
	a lighter dandelion taste	6-8
	Both dandelion and black tea taste lighter	≤5

#### 3.4.2 Test method

Weigh 4 samples of dandelion black tea 0.375g each, add 150ml boiling water at the same time,

and place for 5min.

### 3.4.3 Test results

Dandelion black tea presents red and yellow as the best, so this paper chooses color, aroma and taste as three factors for the sensory evaluation. And the results are shown in table 5.

Table 5 The results of sensory evaluation

Sample	Quality of fermented leaves	Evaluation
H1	Yellow green, green stripe still is much, faint scent	Light
H2	Red and yellow, with rich floral and fruity aroma	Moderate
H3	Dark red and yellow, with rich floral and fruity aroma	Excessive
H4	Dark red, low stuffy aroma	Excessive

According to the GB/T 14487-2008 and Sensory quality evaluation standard of dandelion black tea, the sensory scores results are shown in table 6.

Table 6 The sensory scores results of dandelion black tea

Sample	Color and luster	Aroma	Taste	Average
H1	8.0	8.0	8.0	8.0
H2	9.0	8.5	8.7	8.73
H3	9.0	8.0	8.0	8.33
H4	7.5	7.5	8.0	7.67

According to the sensory scores results of dandelion black tea (table 6), the average of H2 is the best. So, the fermentation time of H2 is the most appropriate considering only sensory evaluation of tea.

## 4. Conclusions

Tea pigment is higher, but it is not the tea better. The selection of dandelion black tea should be combined with tea pigment and sensory evaluation simultaneously. Comprehensive analysis of four different fermentation time of dandelion black tea, the H2 has the best taste, black tea pigment and leaching rate. So, the fermentation time of 20h is the best for dandelion.

## References

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