

# Studies on Collection Breeding and Application of Zingiberaceae Plants Wild Resources in China

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**Abstract:** Zingiberaceae wild plants are abundant, diverse in form and color, and are important resources for the development of new varieties of cultivation. There are about 1300 species of 52 genera in the world, which are widely distributed in tropical and subtropical regions. The application value of Zingiberaceae wild plant resources has long attracted the attention of domestic experts and scholars. However, so far, introduction, breeding and application of Zingiberaceae wild plant resources have not been systematically introduced and studied. In this paper, based on the analysis of Zingiberaceae wild plants germplasm resources distribution, the result was reported that South China Botanical Garden of Chinese Academy of Sciences introduced and related studies on the Zingiberaceae wild plant germplasm resources and has collected Zingiberaceae wild plants 18 genera and 116 species in China since the 1970s. Now, all the Zingiberaceae wild plants have planted in the endangered base and the greenhouse in South China Botanical Garden of China Academy of Sciences. At the same time, through the collection of wild resources of Zingiberaceae plants in China, systematic research on sexual, asexual and tissue culture and breeding technology of Zingiberaceae wild plants was carried out to explore the application of wild resources of Zingiberaceae plants in underforest economy, ethnic medicine and garden landscape, in order to provide references for further development and utilization of zingiberaceae wild plant resources.

**Keywords:** Zingiberaceae Plants, Wild Resources, Collection, Breeding, Application, China

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## 1. Introduction

Most of the Zingiberaceae plants are perennial, terrestrial herbs, usually with aromatic, creeping or blocky rhizomes or the ends of the roots that are swollen and blocky. Ginger (*Zingiber officinale*) as a condiment is a household name, Sharen (*Amomum villosum*), Yizhi (*Alpinia oxyphylla*), Gaoliangjiang (*Alpinia officinarum*), Turmeric (*Curcuma*

*longa*), Zedoary turmeric (*Curcuma phaeocaulis*) and Yujin (*Curcuma aromatica*) have been widely known as Chinese herbal medicines [1-2]. Thailand has collected more than 200 varieties of wild Zingiberaceae plants and constructed gardens according to different genera and species such as *Zingiber*, *Alpinia*, *Curcuma*, and *Zingiber* for protection, trial planting, cultivation, and viewing by tourists [3-4]. The application value of Zingiberaceae plant has aroused the attention of domestic experts and scholars, but the introduction, breeding

and application of the wild resources of Zingiberaceae plants are not systematically studied [5]. In this paper, the wild resources of Zingiberaceae plants in China were collected and their breeding techniques were studied in order to provide reference for the development and utilization of Zingiberaceae plants.

## 2. Distribution of Zingiberaceae Plant Germplasm Resources

Zingiberaceae has about 1300 species of 52 genera worldwide, widely located in tropical and subtropical regions, with diverse centres of diversity in tropical Asia. There are only 1 genera (*Renealmia*) in the Americas, and 4 genera (*Aframomum*, *Aulotandra*, *Renealmia* and *Siphonochilus*) in Africa. In Asia, Zingiberaceae plants can be distributed to Japan (northern latitude 33°), the highest height can be distributed to Himalaya Mountain 4800 m. China has 20 genera 226 species, mainly distributed in the southwest and Southeast provinces, especially in Yunnan, Hainan and Guangdong and Guangxi Province [6-7].

## 3. Collection of Zingiberaceae Plant Germplasm Resources

South China Botanical Garden of Chinese Academy of Sciences introduced and related studies on the Zingiberaceae plant germplasm resources since the 1970s, there are 116 species of 18 genera of Zingiberaceae plants in China (table 1) [8-9], of which there are 25 species of the genus *Alpinia*, 17 species of the genus *Amomum*, 3 species of the genus *Boesenbergia*, 11 species of the genus *Curcuma*, 4 species of the genus *Etingera*, 4 species of the genus *Globba*, 15 species of the genus *Hedychium*, 2 species of the genus *Hornstedtia*, 4 species of the genus *Kaempferia*, 1 species of the genus *Caulokaempferia*, 1 species of the genus *Plagiostachys*, 1 species of the genus *Pommereschea*, 1 species of the genus *Pyrgoophyllum*, 1 species of the genus *Rhynchanthus*, 4 species of the genus *Roscoea*, 1 species of the genus *Siliquamomum*, 1 species of the genus *Stahlianthu*, and 20 species of the genus *Zingiber* were collected. The species that have been collected have been planted in the endangered conservation base and greenhouse of the South China Botanical Garden.

Table 1. Zingiberaceae Plants in China Have Been Collected.

Number	Specific Name	Genus Name	Florescence	Reproduction	Application Prospect
1	<i>A. calcarata</i> Roscoe	<i>Alpinia</i>	Jun.--Jul.	Easy reproduction	Suitable for cultivation
2	<i>A. conchigera</i> Griffith	<i>Alpinia</i>	Apr.--May	Easy reproduction	
3	<i>A. coriandriodora</i> D. Fang	<i>Alpinia</i>	May-- Jul.	Easy reproduction	
4	<i>A. galanga</i> (L.) Willd.	<i>Alpinia</i>	May--Jun.	Easy reproduction	Suitable for cultivation
5	<i>A. graminifolia</i> D. Fang	<i>Alpinia</i>	Apr.--May	Easy reproduction	
6	<i>A. guinanensis</i> D. Fang	<i>Alpinia</i>	May-- Jul.	Easy cultivation	
7	<i>A. hainanensis</i> K. Schum	<i>Alpinia</i>	Feb.--Apr.	Easy reproduction	
8	<i>A. japonica</i> (Thunb.) Miq.	<i>Alpinia</i>	Apr.--May	Easy reproduction	
9	<i>A. kwangsiensis</i> T. L. Wu	<i>Alpinia</i>	Mar.--Apr.	Easy cultivation and easy flowering	
10	<i>A. maclurei</i> Merr.	<i>Alpinia</i>	Jun.--Jul.	Easy reproduction	
11	<i>A. malaccensis</i> Roscoe	<i>Alpinia</i>	Apr.--May	Easy cultivation Easy flowering	Suitable for cultivation
12	<i>A. nigra</i> (Gaertn.) Burt	<i>Alpinia</i>	May-- Jul.	Easy cultivation	Suitable for cultivation
13	<i>A. oblongifolia</i> Hayata	<i>Alpinia</i>	May-- Jun.	Easy cultivation	
14	<i>A. officinarum</i> Hance	<i>Alpinia</i>	Apr.--May	Easy reproduction	
15	<i>A. oxyphylla</i> Miq.	<i>Alpinia</i>	May-- Jul.	Easy reproduction	Medicinal plant
16	<i>A. platytilus</i> K. Schum	<i>Alpinia</i>	Feb.--Apr.	Easy cultivation Easy flowering	Suitable for cultivation
17	<i>A. polyantha</i> D. Fang	<i>Alpinia</i>	Apr.--May	Easy reproduction	
18	<i>A. pumila</i> Hook. f.	<i>Alpinia</i>	Mar.--Apr.	Easy cultivation Easy flowering	
19	<i>A. rugosa</i> S. J. Chen	<i>Alpinia</i>	Apr.--Jun.	Easy cultivation Easy flowering	Suitable for cultivation
20	<i>A. Roxburghii</i> Sweet	<i>Alpinia</i>	Mar.--Apr.	Easy reproduction	
21	<i>A. sichuanensis</i> Z. Y. Zhu	<i>Alpinia</i>	Jun.--Sep.	Easy cultivation Easy flowering	
22	<i>A. stachyodes</i> Hance	<i>Alpinia</i>	May-- Jul.	Easy reproduction	
23	<i>A. strobiliformis</i> T. L. Wu	<i>Alpinia</i>	Apr.	Easy cultivation	
24	<i>A. tonkinensis</i> Gagnep	<i>Alpinia</i>	Mar.--Apr.	Easy cultivation Easy flowering	
25	<i>A. zerumbet</i> Burt	<i>Alpinia</i>	Mar.--Apr.	Easy cultivation	
26	<i>A. Biflorum</i> Jack	<i>Amomum</i>	4 Month	Easy reproduction	
27	<i>A. chinense</i> Chun	<i>Amomum</i>	Mar.--Jun.	Easy cultivation Easy flowering	
28	<i>A. dealbatum</i> Roxb.	<i>Amomum</i>	Mar.--Jun.	Easy cultivation	
29	<i>A. gagnepainii</i> T. L. Wu	<i>Amomum</i>	Feb.--Apr.	Easy cultivation	
30	<i>A. glabrum</i> S. Q. Tong	<i>Amomum</i>	Apr.--Jun..	Easy cultivation	
31	<i>A. koenigii</i> J. F. Gmelin	<i>Amomum</i>	Mar.--Apr.	Easy cultivation	
32	<i>A. longiligulare</i> T. L. Wu	<i>Amomum</i>	Jun.--Sep.	Easy reproduction	
33	<i>A. longipetiolatum</i> Merr.	<i>Amomum</i>	May-- Jul.	Easy cultivation	
34	<i>A. maximum</i> Roxb.	<i>Amomum</i>	Apr.	Easy cultivation	Wild vegetable
35	<i>A. muricarpum</i> Elm.	<i>Amomum</i>	Mar.--Apr.	Easy cultivation	
36	<i>A. microcarpum</i> C. F. Liang	<i>Amomum</i>	Mar.--Apr.	Easy cultivation	Medicinal plant
37	<i>A. petaloideum</i> T. L. Wu	<i>Amomum</i>	Apr.	Easy cultivation	
38	<i>A. quadratolaminare</i> S. Q. Tong	<i>Amomum</i>	Mar.--May	Easy cultivation	

Number	Specific Name	Genus Name	Florescence	Reproduction	Application Prospect
39	<i>A. sericeum</i> Roxb	<i>Amomum</i>	Dec.--Apr.	Easy cultivation	
40	<i>A. tsaoko</i> Crevost	<i>Amomum</i>	Apr.	Easy cultivation	
41	<i>A. Verum</i> Blackw.	<i>Amomum</i>	Mar.--Jun.	Easy to cultivate	
42	<i>A. villosum</i> Lour.	<i>Amomum</i>	Jan.--Mar.	Easy cultivation Easy flowering	Medicinal plant
43	<i>B. albomaculata</i> S. Q. Tong	<i>Boesenbergia</i>	May-- Jun.	Easy cultivation	
44	<i>B. longiflora</i> Kuntze	<i>Boesenbergia</i>	Jun.--Jul.	Easy cultivation Easy flowering	
45	<i>B. rotunda</i> (L.) Mansf.	<i>Boesenbergia</i>	Apr.--May	Easy reproduction	
46	<i>C. amarissima</i> Roscoe	<i>Curcuma</i>	May-- Jul.	Easy cultivation Easy flowering	
47	<i>C. aromatica</i> Salisb.	<i>Curcuma</i>	May-- Jun.	Easy cultivation Easy flowering	Medicinal plant
48	<i>C. elata</i> Roxb.	<i>Curcuma</i>	Apr.--May	Easy reproduction	
49	<i>C. flaviflora</i> S. Q. Tong	<i>Curcuma</i>	May-- Jul.	Easy cultivation Easy flowering	
50	<i>C. kwangsiensis</i> S. G. Lee	<i>Curcuma</i>	Feb.--Apr.	Easy reproduction	
51	<i>C. longa</i> L.	<i>Curcuma</i>	Apr.--May	Easy cultivation Easy flowering	Medicinal plant
52	<i>C. nankunshanensis</i> N. Liu	<i>Curcuma</i>	Mar.--Apr.	Easy reproduction Easy cultivation	
53	<i>C. phaeoaulis</i> Valetton	<i>Curcuma</i>	Jun.--Jul.	Easy cultivation Easy flowering	Medicinal plant
54	<i>C. sichuanensis</i> X. X. Chen	<i>Curcuma</i>	Apr.--May	Easy cultivation Easy flowering	
55	<i>C. yunnanensis</i> N. Liu & S.	<i>Curcuma</i>	May-- Jul.	Easy reproduction Easy cultivation	
56	<i>C. zanthorrhiza</i> Roxburgh	<i>Curcuma</i>	May-- Jun.	Easy cultivation Easy flowering	
57	<i>E. Elatior</i> R. M. Smith	<i>Etilingera</i>	Apr.--May	Easy reproduction Easy cultivation	Suitable for cultivation
58	<i>E. Littoralis</i> Giseke	<i>Etilingera</i>	May-- Jul.	Easy cultivation Easy flowering	
59	<i>E. pyramidosphaera</i> R. M. Smith	<i>Etilingera</i>	Feb.--Apr.	Easy cultivation Easy flowering	
60	<i>E. Yunnanensis</i> R. M. Smith	<i>Etilingera</i>	Apr.--May	较 Easy cultivation	Endangered species
61	<i>G. marantiana</i> K. Schum	<i>Globba</i>	Mar.--Apr.	Easy cultivation Easy flowering	
62	<i>G. emeiensis</i> Z. Y. Zhu	<i>Globba</i>	Apr.	Easy cultivation Easy flowering	
63	<i>G. racemosa</i> Smith	<i>Globba</i>	Mar.--May	Easy reproduction	
64	<i>G. schomburgkii</i> Hook. f.	<i>Globba</i>	Jan.--Mar.	Easy cultivation Easy flowering	
65	<i>H. bijiangense</i> T. L. Wu	<i>Hedychium</i>	May-- Jun.	Easy reproduction	Suitable for promotion
66	<i>H. brevicaule</i> D. Fang	<i>Hedychium</i>	Jun.--Jul.	Easy cultivation Easy flowering	
67	<i>H. coccineum</i> Smith	<i>Hedychium</i>	Apr.--May	Easy reproduction	Suitable for cultivation
68	<i>H. coronarium</i> Koen	<i>Hedychium</i>	May-- Jul.	Easy cultivation Easy flowering	Medicinal plant
69	<i>H. densiflorum</i> Wall.	<i>Hedychium</i>	May-- Jun.	Easy cultivation Easy flowering	
70	<i>H. efilamentosum</i> Hand.-Mazz.	<i>Hedychium</i>	Apr.--May	Easy reproduction Easy cultivation	
71	<i>H. flavum</i> Roxb	<i>Hedychium</i>	May-- Jul.	Easy cultivation Easy flowering	
72	<i>H. forrestii</i> Diels	<i>Hedychium</i>	Feb.--Apr.	Easy reproduction	Suitable for cultivation
73	<i>H. gardnerianum</i> Roscoe	<i>Hedychium</i>	Apr.--May	Easy cultivation Easy flowering	Suitable for cultivation
74	<i>H. kwangsiense</i> T. L. Wu	<i>Hedychium</i>	Apr.	Easy reproduction	
75	<i>H. nutantiflorum</i> H. Dong	<i>Hedychium</i>	Mar.--May	Easy cultivation Easy flowering	
76	<i>H. spicatum</i> Smith	<i>Hedychium</i>	Jan.--Mar.	Easy cultivation Easy flowering	
77	<i>H. stenopetalum</i> Lodd	<i>Hedychium</i>	May-- Jun.	Easy reproduction	
78	<i>H. villosum</i> Wall	<i>Hedychium</i>	Jun.--Jul.	Easy cultivation Easy flowering	
79	<i>H. yunnanense</i> Gagnep	<i>Hedychium</i>	Apr.--May	Easy reproduction	
80	<i>H. hainanensis</i> T. L. Wu & S. J. Chen	<i>Hornstedtia</i>	May-- Jun.	Easy cultivation	
81	<i>H. tibetica</i> T. L. Wu & S. J. Chen	<i>Hornstedtia</i>	May-- Jun.	Easy cultivation	
82	<i>K. elegans</i> (Wall.) Bak.	<i>Kaempferia</i>	Apr.--May	Easy cultivation	
83	<i>K. galanga</i> L.	<i>Kaempferia</i>	May-- Jul.	Easy reproduction	Medicinal plant
84	<i>K. parviflora</i> Wall.ex Bake	<i>Kaempferia</i>	Feb.--Apr.	Easy cultivation Easy flowering	
85	<i>K. rotunda</i> L.	<i>Kaempferia</i>	Apr.--May	Easy cultivation Easy flowering	Medicinal plant
86	<i>M coenobialis</i> (Hance) K. Larsen	<i>Monolophus</i>	Apr.	Easy reproduction	Suitable for cultivation
87	<i>P. austrosinensis</i> T. L. Wu & S. J. Chen	<i>Plagiostachys</i>	Mar.--May	Easy cultivation Easy flowering	
88	<i>P. lackneri</i> Wittm.	<i>Pommereschea</i>	Jan.--Mar.	Easy cultivation Easy flowering	
89	<i>P. yunnanense</i> (Gagnep.) T. L. Wu & S. J. Chen	<i>Pyrgoophyllum</i>	May-- Jun.	Easy reproduction	
90	<i>R. beesianus</i> W. W. Smith	<i>Rhynchanthus</i>	Jun.--Jul.	Easy cultivation Easy flowering	
91	<i>R. auriculata</i> K. Schum.	<i>Roscoea</i>	Apr.--May	Easy reproduction	
92	<i>R. cautleyoides</i> Gagnep.	<i>Roscoea</i>	May-- Jul.	Easy cultivation	
93	<i>R. humeana</i> Balf. f. & W. W. Sm.	<i>Roscoea</i>	May-- Jun.	Easy cultivation	
94	<i>R. tibetica</i> Bat.	<i>Roscoea</i>	Apr.--May	Easy cultivation	
95	<i>S. tonkinense</i> Baill.	<i>Siliquamomum</i>	May-- Jul.	Easy reproduction	
96	<i>S. involucratus</i> (King ex Bak.) Craib	<i>Stahlianthus</i>	Feb.--Apr.	Easy cultivation Easy flowering	Medicinal plant
97	<i>Z. atrotubens</i> Gagnep.	<i>Zingiber</i>	Apr.--May	Easy cultivation Easy flowering	
98	<i>Z. cochleariforme</i> D. Fang	<i>Zingiber</i>	Apr.	Easy reproduction	
99	<i>Z. corallinum</i> Hance	<i>Zingiber</i>	Mar.--May	Easy cultivation Easy flowering	
100	<i>Z. densissimum</i> S. Q. Tong & Y. M. Xia	<i>Zingiber</i>	Jan.--Mar.	Easy cultivation Easy flowering	
101	<i>Z. ellipticum</i> (S. Q. Tong & Y. M. Xia) Q.G. Wu & T. L. Wu	<i>Zingiber</i>	May-- Jun.	Easy cultivation Easy flowering	
102	<i>Z. gulinense</i> Y. M. Xia	<i>Zingiber</i>	Jun.--Jul.	Easy reproduction	
103	<i>Z. longiligulatum</i> S. Q. Tong	<i>Zingiber</i>	Apr.--May	Easy cultivation Easy flowering	
104	<i>Z. mioga</i> (Thunb.) Roscoe	<i>Zingiber</i>	May-- Jul.	Easy cultivation Easy flowering	

Number	Specific Name	Genus Name	Florescence	Reproduction	Application Prospect
105	<i>Z. monglaense</i> S. J. Chen & Z. Y. Chen	<i>Zingiber</i>	May-- Jun.	Easy reproduction	
106	<i>Z. montana</i> (J. Koenig ex Retz. ) Theilade	<i>Zingiber</i>	Apr.--May	Easy cultivation Easy flowering	
107	<i>Z. nudicarpum</i> D. Fang	<i>Zingiber</i>	May-- Jul.	Easy reproduction	
108	<i>Z. officinale</i> Roscoe	<i>Zingiber</i>	Feb.--Apr.	Easy reproduction	Medicinal plant
109	<i>Z. orbiculatum</i> S. Q. Tong	<i>Zingiber</i>	Apr.--May	Easy cultivation Easy flowering	
110	<i>Z. recurvatum</i> S. Q. Tong & Y. M. Xia	<i>Zingiber</i>	May-- Jul.	Easy reproduction	
111	<i>Z. roseum</i> (Roxb.) Roscoe	<i>Zingiber</i>	May-- Jun.	Easy cultivation Easy flowering	
112	<i>Z. striolatum</i> Diels	<i>Zingiber</i>	Apr.--May	Easy cultivation Easy flowering	Wild vegetable
113	<i>Z. thorelii</i> Gagnep.	<i>Zingiber</i>	May-- Jul.	Easy reproduction	
114	<i>Z. yingjingense</i> S. Q. Tong	<i>Zingiber</i>	Feb.--Apr.	Easy cultivation Easy flowering	
115	<i>Z. yunnanense</i> S. Q. Tong & X. Z. Liu	<i>Zingiber</i>	Apr.--May	Easy reproduction	
116	<i>Z. zerumbet</i> Smith, Exoct. Bot.	<i>Zingiber</i>	May-- Jul.	Easy reproduction	Wild vegetable

## 4. Breeding Technology of Zingiberaceae Plants

Zingiberaceae plants are mostly perennial and semi-positive plants. Most of them can endure strong light and have strong negative tolerance. They have extensive management and have been widely used in gardens in tropical and subtropical regions. Zingiberaceae plants are best planted in sparse undergrowth when they are arranged in the field, and can also be planted in patches or clumps at the edge of the pond.

### 4.1. Sexual Reproduction

Except for some cultivated species and hybrids, Zingiberaceae plants can usually breed their offspring with seeds. However, attention should be paid to the timing of fruit harvest during actual operation. In general, seeds in medium-ripe light yellow fruits and mature yellow brown fruits have higher germination rate. In order to ensure the emergence of seedlings quickly and neatly, pregermination is generally carried out before sowing. Pregermination is usually carried out by means of water immersion and stratification. In addition, the seed coat of Zingiberaceae is poor in water permeability and has aril. Therefore, before sowing, seeds can be mixed with clean fine sand and wrapped in gauze and rubbed in water to remove aril.

### 4.2. Asexual Reproduction

#### 4.2.1. Reproduction of Ramets

Zingiberaceae plants can usually use rhizomes to plant and propagate. When the rhizomes are used for branch propagation, plants with strong growth and multiple tillering buds are selected and cut off from the gap of the rhizomes of the plants according to the natural growth potential. After the cut is dried, the plants are separately planted.

#### 4.2.2. Points Ball Reproduction

Most of the zingiberaceae flower discards have massive or globular rhizomes, so it is also possible to use the method of bulbous propagation. After falling asleep in autumn, the bulbs and rhizomes are dug out from the mother's balls and divided into separate new plants.

### 4.2.3. Bead Bud Propagation

Some species of Zingiberaceae flowers in the genus Zingiberaceae often have pearl buds in the axils of their inflorescence bracts. Taking off the pearl buds, they are sown in a warm and moist bed, and these pearl buds can germinate to form new plants. The plants formed by the pearl buds have high growth regularity and can maintain the excellent characteristics of the female parent.

### 4.2.4. Cuttage Propagation

Cutting propagation is a common propagation technique in Zingiberaceae. During operation, leaf stems are usually cut into segmented stem segments after flowering or fruit ripening. Selecting shady and wet places or using shady sheds as cuttings and inserting stem ends into substrates, the seedling rate can reach more than 70% under general management conditions.

### 4.3. Tissue Culture

The mass reproduction of Zingiberaceae flowers can be carried out by tissue culture technique. In general, the suction bud, inflorescence axis and young stems are used as ex plants. At present, there are more than 10 kinds of Zingiberaceae flowers in China, including Ginger Lotus (*Curcuma alismatifolia*), Bai Jianghua (*Hedychium chrysoleucum*), Ginger Flower (*Hedychium coronarium*), Turmeric (*C. Longa*), Yellow ginger flower (*Hedychium flavum*), Chanyeliang (*Alpinia sanderae*), Torch ginger (*Etilingera elatior*), Flower-leaf-yan Shan Jiang (*Alpinia zerumbet* ' variegata '), Yujin (*C. Aromatica*), Mountain Nai (*Kaempferia galanga*), Round flap ginger (*H. Formosana*), Hainan amomum (*Amomum longiligulare*), Kin Jiang (*Hedychium gardnerianum*), etc. [10-12].

## 5. Application of Zingiberaceae Plants

### 5.1. Important Economic Plants Under Forests

Zingiberaceae plant is one of the important components of herbs under tropical rainforest and monsoon evergreen broad-leaved forest, most of which are evergreen and grow in humid shade environment. It is a multi-purpose resource plant group and is one of the most cultivated and utilized plants [13]. For example, *Amomum villosum* is widely planted in undergrowth and ginger (*Zingiber officinale*) is also cultivated

on a large scale. It has become one of the important sources of economic plants in our country and has played a certain role in the development of local economy and poverty alleviation in poor areas.

### 5.2. Important Ethnic Medicinal Plants

Zingiberaceae is a famous family of medicinal plants. There are about 500 kinds of medicinal plants in Zingiberaceae that have been sorted out, many of which are used as medicinal materials [14], such as *C. longa*, *C. phaeocaulis*, *C. aromatica*, *Amomum kravanh*, *Alpinia katsumadai*, *Amomum villosum*, *Alpinia officinarum*, etc. In addition, *Alpinia nigra* has the functions of promoting qi circulation and detoxifying, and is used to treat food stagnation and snake bite. Root of *Alpinia officinaris* and Rhizomes of *Hedychium tomentosum* can dispel wind and relieve cough. The rhizome of *Alpinia speciosa* is used as medicine to relieve swelling and pain. The fruit of glob ba race mosa is used for invigorating stomach. The rhizome of *Alpinia officinarum* is used as medicine, warming stomach in middle temperature, dispelling cold and relieving pain, etc.

### 5.3. Important Garden Plants

Zingiberaceae plants are not only beautiful flowers, but also important seasonings and wild vegetables, which naturally become an important part of garden plants [15-16]. There are more than 20 species suitable for garden cultivation, for example, the fruit and tender stem of *Amomum villosum* can be eaten. The tender stems of *Hedychium coroner* are edible. The yellow flower of *H. flavum* is very fragrant and its rhizome is used as medicine. Purple ginger (*Zingiber pureputium*) is a medicinal rhizome and also a substitute for ginger. Medicinal, seasoning and ornamental use of kaempferia (*K. galanga*); Young stems of *Kaempferia rotunda* are eaten, rhizomes are used as seasonings and medicines, and flowers are beautiful for gardens to watch. Turmeric (*C. longa*) and Turmeric (*C. aromatic*) are ornamental gardens and medicinal rhizomes. Cardamom (*Alpinia galanga*) garden view, fruit medicine; Peach (*Alpinia zerumbet*) garden view, fruit medicine; Rhizoma (*Alpinia conchigera*) is ornamental in the garden, and fruit medicine is also used as rice wine spice.

## 6. Conclusion

Zingiberaceae is rich in wild plant resources, which are widely distributed, various in variety, different in shape and various in color. It is an important resource for developing new cultivated varieties. Zingiberaceae wild plants have been widely developed and utilized in all countries of the world. 116 species of 18 genera of Zingiberaceae plants were collected in China. In recent years, with the deforestation, the environmental damage on which Zingiberaceae plants depend for their survival has become increasingly serious. Many species are already very rare. Some endemic and local species with narrow habitats and small geographical distribution are

already in an endangered state. It is urgent to protect and rationally develop and utilize Zingiberaceae plant resources. Therefore, the research on Zingiberaceae plants must be further strengthened.

First, attach importance to collection, sorting, innovation and utilization of Zingiberaceae plant germplasm resources. Although there are many local varieties of Zingiberaceae plants in China, due to geographical limitations and relatively narrow genetic background, they are far from meeting the needs of breeding. Therefore, in the future, while the domestic Zingiberaceae germplasm resources should be extensively sorted out, the introduction of foreign ginger germplasm should be increased, and the identification, evaluation and innovative utilization research of Zingiberaceae germplasm resources should be carried out, including the improvement of yield and quality traits, resistance to diseases and insect pests and other major traits, so as to provide a fine germplasm with clear characteristics for Zingiberaceae plant breeding.

Second, strengthen the application of biotechnology in plant breeding of Zingiberaceae. It is difficult for the cultivated varieties of Zingiberaceae to blossom and bear fruit, and it is difficult to carry out sexual cross breeding. Therefore, the application research of biotechnology breeding in Zingiberaceae plants should be strengthened, including further improving the technology system of in vitro organ and protoplast culture and plant high frequency regeneration of Zingiberaceae plants, using cell fusion technology for interspecific somatic hybridization, cloning of key genes of important traits and efficient genetic transformation system, so as to strengthen gene exchange among varieties and create new germplasm of Zingiberaceae plants. At the same time, through the identification, evaluation and optimization of Zingiberaceae plant germplasm resources, special Zingiberaceae plant varieties with different uses are cultivated in a targeted way.

Thirdly, improve the system of fine variety breeding of Zingiberaceae plants. The characteristics of long-term asexual reproduction of Zingiberaceae plants, as well as the current cultivation status of Zingiberaceae plants, easily lead to various kinds of sexual degeneration. Therefore, while strengthening germplasm innovation and breeding of new varieties of Zingiberaceae plants, it is necessary to strengthen research on breeding techniques of fine varieties of Zingiberaceae plants and establish a multi-level breeding technique system of variety selection and fine varieties to prevent hybrid degeneration of varieties. In addition, cross-regional cooperation and breeding in different places can be adopted to build breeding bases for fine varieties of Zingiberaceae plants, effectively control the spread and spread of destructive soil-borne diseases such as *Phytophthora infestans* in Zingiberaceae, and promote the sustainable and healthy development of Zingiberaceae plant industry.

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