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Contents

Officially Released Mutant Varieties in China

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Abstract

The use of mutation techniques for crop improvement in China has a long and well-established tradition of more than 50 years. As the result of intensive research in many institutes dealing with application of nuclear technologies more than 620 cultivars of 44 crop species have been released. Numerous mutant varieties have been grown on a large scale bringing significant economic impact, sustaining crop production and greatly contributing to increase of food production also in stress prone areas of the country. However, there is still missing information not only on the number of mutant varieties released in particular crop species but also on mutagens applied, selection approaches and on the use of mutants in cross breeding. Numerous Chinese scientists collected and systematized this information. Results of their work were often published in local scientific journals in the Chinese language and as such were unavailable to breeders from other countries. Having this in mind, we requested Dr. Liu Luxiang, the Director of the Department of Plant Mutation Breeding and Genetics, Institute for Application of Atomic Energy, Chinese Academy of Agricultural Sciences in Beijing to help us in finding as much information as possible on mutant varieties officially released in China. The data has been collected in close collaboration with his colleagues from

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various institutions all over the country and then evaluated, edited and prepared for publication by our team responsible for the FAO/IAEA Database of Officially Released Mutant Varieties. We would like to thank all Chinese colleagues who contributed to this list of Chinese mutant varieties. We hope that this publication will stimulate plant breeders in China to collect more information on released mutant varieties and especially on the use of mutated genes in cross breeding.

INTRODUCTION

In China, the application of nuclear techniques in agricultural researches started with its use in crop breeding in the late 1950s. The technical cooperation between Chinese research institutions and the IAEA has contributed a lot to the spread and application of this new technology in China, *e.g.* the Chinese translation of the Agency's book *Manual on Mutation Breeding* has helped many Chinese breeders master this new technique. Rice is the most important crop in China, and the success of induced mutations in rice improvement is also most significant. From the late 1950s to mid-1960s, numerous semidwarf mutants and mutant varieties had been developed, which was almost parallel with the Green Revolution. But the first significant success did not come until the mid-1970s, when the early mutant variety, Yuanfengzao, was released. It was planted on more than 1.5 millions ha a year in the late 1970s. The success was further expanded by another mutant variety, Zhefu 802, which later became the most widely planted conventional rice variety during 1987-1994 in China, with an accumulative planting acreage of 10.5 million ha. The success continues with the rapid expansion of planting area of the new mutant variety Yangdao 6 (released in 1997) and with its high yield and superior grain quality in the new millennium. Yangdao 6 is also the male parent of the super hybrid rice Liangyoupeijiu (Pai'ai 64s x Yangdao 6, registered in 2001), and it is also the rice variety that was used in *indica* rice genome sequencing by Chinese scientists. Till 2002, Yangdao 6 and Liangyoupeijiu had been planted accumulatively on more than 3.5 million ha, and it is estimated that the planting area will be more than 2 million ha in 2003. In China, the success of induced mutations was not only limited to rice. From the data we collected here, it could be seen clearly that this technique is applicable to various crops (Table 1) and in diversified research institutions, and thus is a very powerful and economical breeding tool.

INSTITUTIONS FOR APPLICATION OF NUCLEAR TECHNIQUES IN PLANT BREEDING IN CHINA

In China the first research laboratory for the application of atomic energy in agriculture, the Institute for Application of Atomic Energy (IAAE), was established in Beijing in 1957 under the auspices of the Chinese Academy of Agricultural Sciences (CAAS). Nowadays there are more than 20 Institutes of Application of Atomic Energy (IAAE) in various Provincial Academy of Agricultural Sciences (AAS) spread throughout the country. These institutes are working on the application of induced mutations in breeding of main crops.

There are also many Regional Institutes for Agricultural Sciences (RIAS) located in the different provinces, universities and smaller institutes that have a close collaboration with AAS on the use of nuclear techniques in agriculture. (Fig. 1)

The IAAE of CAAS in Beijing has been the main co-ordinator of national research projects on plant breeding and genetics with the use of mutation techniques since the 1980's. The IAAE has received continuous support for these projects from both the national and Provincial Governments through 5-year plans. IAAE of CAAS hosts the Chinese Society of Nuclear Agricultural Sciences that also publishes *Acta Agriculturae Nucleatae Sinica* and *the Journal of Nuclear Agricultural Sciences,* both on a bimonthly basis. Furthermore, IAAE of CAAS organizes national workshops on different topics whenever needed.

Three networks mainly contributed to the establishing of facilities and development of research on application of nuclear technology in plant breeding in China. They are - the research collaboration network focusing on IAAEs of CAAS, the academic exchange network involving the Chinese Society of Nuclear Agricultural Sciences hosted by IAAE of CAAS and the international exchange network mainly depending on the IAEA and FNCA.

It is worth mentioning that various kinds of IAEA technical assistance and cooperation with countries of the region have played active promotion roles in achieving mutation assisted breeding in China.

CURRENT STATUS OF MUTATION TECHNIQUES IN CHINA

Three development periods for induced mutations in plants

The use of induced mutations in plants in China has experienced three different developmental periods. The first was in the late 1950's and 1960's. Institutes (or Laboratories) for Application of Atomic Energy were set up in many provinces after the establishment of IAAE of CAAS in 1960. National training courses on induced mutations were held and more than three hundred trainees completed these studies. Experimental facilities for mutation induction were built gradually and initial results in the use of mutants in breeding of such crops as rice, wheat and soybean were obtained.

The second period, including the 1970's and 1980's, was characterized by the rapid development of induced mutation research. Publishing, in 1981, stimulated this activity the Chinese translation of the second edition of the “Manual on Mutation Breeding” originally published by FAO/IAEA in 1977. The translation offered the breeder fundamental knowledge of induced mutations and their applications in crop breeding. Experimental facilities and equipment for induction of mutations were being continuously developed and upgraded. Mutation induction and its use in breeding of various crops were widely carried out. Remarkable achievements had been made in both mutant variety development and basic research on mutation induction. The number of mutant varieties and their cultivated area

increased rapidly. The most famous ten mutant varieties, including rice, wheat, soybean, maize, cotton, sandawang and mulberry, and their breeders won the National Invention Awards. Numerous techniques and approaches were used for improving mutation efficiency especially the use of hybrid seeds for mutagenesis, exploration of various mutagens, combined mutagenic treatment and irradiation of zygotic embryos and other tissues and cells in culture *in vitro* (Wang, 1995; Xu, 1996; Wen, 1999).

The third - is the steady development period from the beginning of the 1990's. Integration of mutation techniques and biotechnology has been highlighted and opened a new way for the use of mutagenesis. Application of mutagenesis in plant tissue culture quickly spread in many mutation research programs and has become a very important area of plant breeding and basic research. A new breeding possibility, which combined crosses, mutation induction and production of doubled haploids, has been successfully proven in improvement of numerous crop species. Using this approach 38 mutant varieties including rice (14), wheat (14), oilseed rape (3), potato (3), barley (2), soybean (1) and maize (1) have been developed and released since 1996. The total accumulated growing area of these varieties reached over 6.7 million hectares by the year 2000. Significant results have also been obtained from application of molecular markers to mutant screening and identification, radiation-assisted genetic transformation system and aerospace induced mutations for crop improvement (Liu and Zheng, 1997).

Crop germplasm enhancement through effective use of physical or chemical mutagens

Along with the sustained quantitative increase of the total grain output in China in the past few years, emphasis on improvement of crop quality characters has been made since 1998. Mutation induction for quality traits has become one of the most important tools in this breeding strategy for many crops. Related research projects have been organized in the tenth 5-year plan and financed by the government.

Work already done in the past 45 years in China suggests that induced mutations are the simplest and fastest way to create new desired genotypes and enhance crop genetic diversity. Besides mutants with earliness and shortness, there are many other favorable mutants. Greenable albino rice mutants W24 and W27, obtained by gamma rays treatment of seeds a thermosensitive genic male sterile line 2177s. The leaf color of the two mutant lines is a useful marker in eliminating contamination by selfed seeds in two-line hybrid rice. In the past few years, eight important male sterile lines have been improved by the use of a mutated albinotic leaf color marker that only expresses at the seedling stage. The first three young leaves are completely albinotic, but the fourth leaf began changing into green from the leaf base to the apex, and the leaf color converted to normal green already after the sixth leaf development. The hybrid combination ‘Quanyou 37’ was involved in the regional test in Zhejiang Province in 1998 and 1999 and showed a significant yield increase in comparison to the control hybrid ‘Shanyou 10’ in both years and released in 2002 (Shu et al, 1996; Liu et al, 1996).

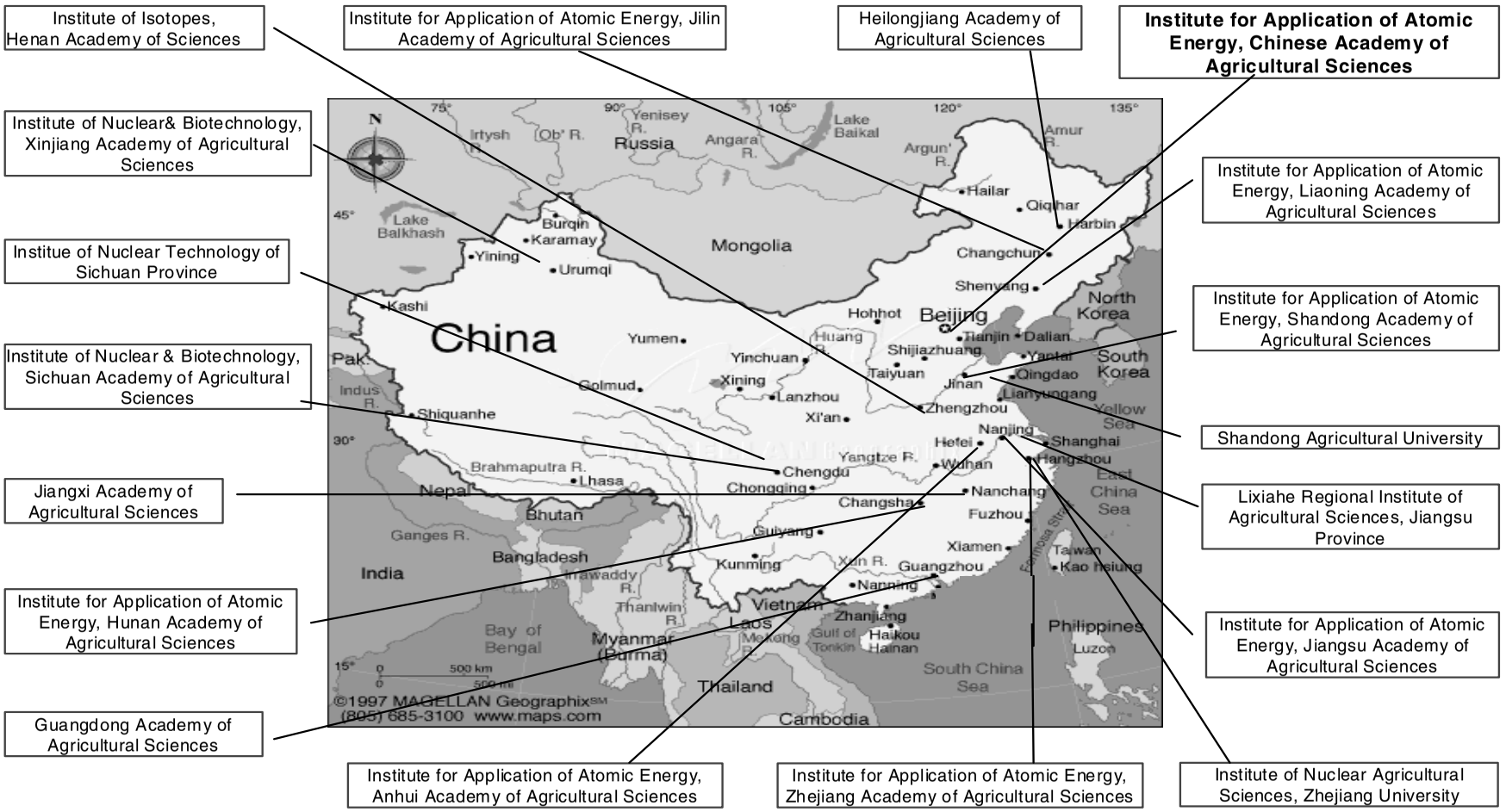

Figure 1. Main institutes applying nuclear techniques in plant breeding in the mainland of China

A chlorophyll-reduced (Cr) seedling mutant Cr3529 was induced by fast neutrons and diethyl sulphate from oilseed rape inbred line 3529. The chlorophyll content in leaves of young Cr seedlings is about one half that of normal chlorophyll (Nc) seedlings, resulting in Cr seedlings with yellow-green cotyledons and leaves. After the five-leaf stage, the chlorophyll content of Cr seedlings increased gradually and the oldest leaves of mature plants had an appearance closer to that of the wild type. The seedling marker could be used to determine purity level of hybrid material at the seedling stage, but also eliminate unwanted sibs. A cytoplasmic male sterile line, Z01A carrying the Cr maker has been developed and used to produce oilseed rape hybrid seeds (Zhao et al, 2000).

A new elongated-uppermost-internode (*eui-1*, after Rutger and Carnahan, 1981) gene, induced by gamma rays in rice has become widely used in hybrid seed production. This was also due to the development of an effective procedure for rapid selection of *eui* mutants in hybrid's parental lines. By seed treatment of maintainers and restorers of male sterile lines with gamma rays, and by direct planting of seedlings in a large M_2 generation, the high frequency of *eui* mutants has been obtained. In this method, it only took four planting seasons (within two years) to transform a common sterile line (A-line) to a *eui* sterile line (eA-line) and two planting seasons (one year) to transform a common restorer line (R-line) to a *eui* restorer (eR-line). This method has gained the patent of technological invention in China. Also, a new *eui* allelic gene was found and named *eui-2*. It would be possible to use the *eui* gene to upgrade the seed production of both hybrids and male sterile lines (Yang, 1999).

The large amount of obtained mutants enriched plant genetic resources and has become a precious material in cross and heterosis breeding. Two thousand samples of 24 plant species mutants with various characters have been collected and catalogued. Some of them have been used in breeding programs and achieved remarkable success. For example, by the use of the peanut mutant 'Fushi' as the parent in cross breeding, series of ten 'Yueyou' varieties have been developed which reached the accumulated growing areas of more than four million hectares. At present, most of the fine peanut varieties planted in Guangdong and South China provinces have a certain affinity relationship with the mutant Fushi. This mutation plays an important role in peanut production in South China and achieved remarkable economic, social and ecological benefit (Cheng, personal communication).

Economic impact of mutant varieties

After 45 years of research and applications, mutation techniques have become one of the most fruitful and widely used methods for crop improvement, and have played an important role in crops, especially in food crop production in China. The total maxmium area per year for cultivation of mutant varities was over 9 million hectars, which accounted for about 1/10 of the total planting area for relevant species in the past 20 years in China. Here are two examples of very successful mutant varities in China.

The Institute of Nuclear Agricultural Sciences, Zhejiang Agricultural University in 1981, released Rice mutant variety 'Zhefu 802'. This institute officially released twelve other mutant varieties between 1962 and 1995. The Zhefu mutant varieties were widely planted in six provinces, and the cumulative area under these varieties reached 14 million ha in 1995. The mutant variety Zhefu 802, was induced by gamma rays in 'Simei No. 2' – also a mutant variety. Zefu 802 was the most extensively planted conventional rice variety between 1986 and 1994 in China; its cumulative planted area reached 10.6 million ha (Shu *et al.*, 1997). The variety 'Zhefu 802' has numerous desired traits: short growing period (bellow 110 days), high yield potential

even under poor management, wide adaptability, high resistance to rice blast and tolerance to cold (Fig. 2).

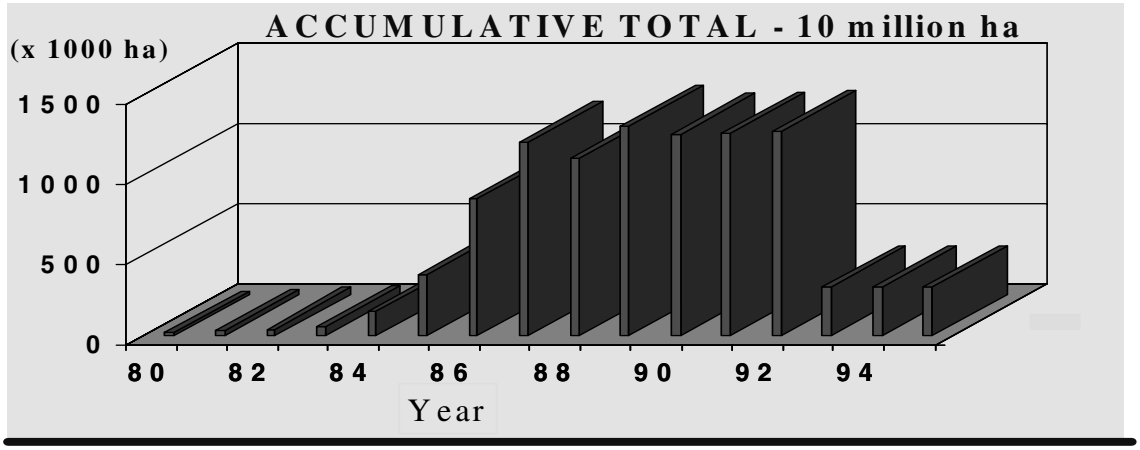

Figure 2. Cultivation area of rice mutant variety Zhefu 802

Wheat mutant variety Yangmai 158 was developed by Lixiahe Regional Institute of Agricultural Sciences of Jiangsu province through gamma rays treatment of hybrid seeds and released in 1993. The cultivation area per year has been over 1.33 million hectares since 1997, and its total accumulated planting area has run out at 9 million hectares by the end of 2001. This variety represents an important progress in wheat breeding for both lower and middle reaches of the Yangtse River in the 1990's, and has become one of the most widely cultivated wheat varieties in China (Fig. 3).

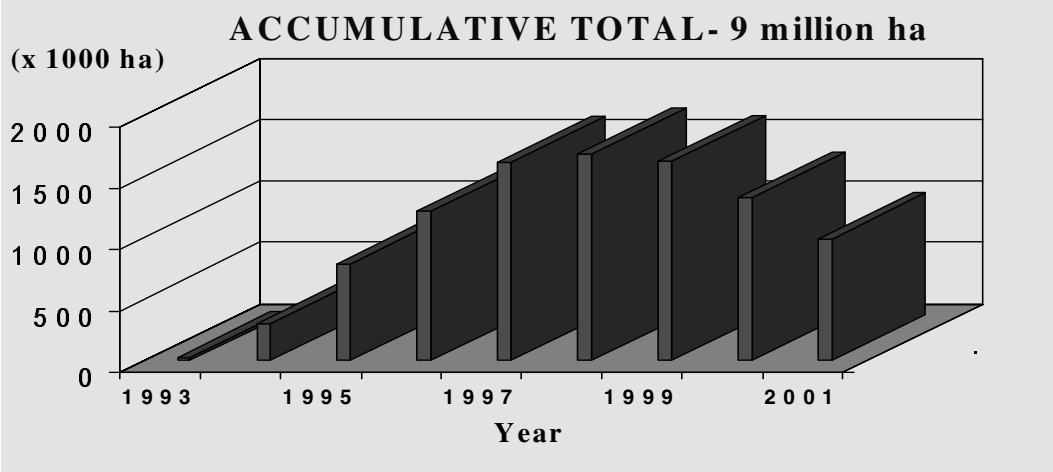

Figure 3. Cultivation area of wheat mutant variety Yangmai 158

STATISTICS

The total number of mutant varieties and mutant derived varieties officially registered in the FAO/IAEA Mutant Varieties Database before the end of 2001 is 2276. This number is still increasing due to the kind collaboration of the counterparts from various countries all over the world. The total number of mutant varieties from China is 629, which includes 44 crops and ornamental species.

Out of these 629 varieties 562 are crop varieties and the remaining 67 cover ornamentals and decorative plants, like chrysanthemums and roses. From the 562 crop varieties 534 are seed propagated crops and 28 varieties belong to the vegetatively propagated crops (Maluszynski et al. 2000). The popularization and utilization of all mutant varieties has made important contribution to China's food production and social and economic development.

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List of Mutant Cultivars Officially Released in China

Name of cultivar	Name of institute	Year of release (or approval)	Mutagenic treatment [parent variety] or cross with mutant or with mutant derived variety	Main character improved
Allium macrostemon	Chinese garlic			
Ningsuan 1	Ninganxian IAS Heilongjiang	1990	gamma rays, 15 Gy [landrace]	yield quality
Arachis hypogaea	groundnut			
78961	Inst. of Groundnut Shandong AAS Shandong	1988	cross MA 143 x RH77-4-2	earliness shortness yield
8130	Inst. of Groundnut Shandong AAS Shandong	1988	cross F_1 (Luhua 4 x BP1) x BP1 (treated with gamma ray 250 Gy)	seed quality yield
Changhua 4	Changwei RIAS Shandong	1972	gamma rays chronic, 15 Gy [Fuhuasheng]	earliness cold tolerance drought tolerance
Fu 21	Inst. of Economic Crops Guangdong AAS Guangdong	1986	gamma rays, 250 Gy [Yueyou 22]	yield shortness disease resistance
Fu 22	South China Agric. College Guangdong	1985	gamma rays	A. flavus resistance
Ganhua 1	Liujiazhan RIAS Jiangxi	1990	gamma rays, 200 Gy [Yueyou 551-11]	earliness high yield
Huayu 16	Inst. of Groundnut Shandong AAS Shandong	1996	gamma rays, 250 Gy	yield seed quality
Lainong 10	Laiyang Agric. College Shandong	1984	laser	earliness yield

Lu 8130	Inst. of Groundnut Shandong AAS Shandong	1993	cross Hua 39 x BP 1	pod size grain weight
Luhua 11	Laiyang Agric. College Shandong	1992	laser [hybrid]	yield
Luhua 13	Inst. of Groundnut Shandong AAS Shandong	1991	cross [F_1(Changda 6 x MA 143) x Baisha 1016] x Luhua 6	yield seed size
Luhua 15	Inst. of Groundnut Shandong AAS Shandong	1994	cross F_2 (7896 x Runner) x Irradiated Runner (250 Gy gamma rays)	seed quality earliness
Luhua 6	Inst. of Groundnut Shandong AAS Shandong	1986	gamma rays, 240 Gy [Baisha 1016]	earliness yield
Luhua 7	Inst. of Groundnut Shandong AAS Shandong	1986	gamma rays, 240 Gy [Linhua 1]	logging resistance adaptability yield
P12	Inst. of Groundnut Shandong AAS Shandong	1986	cross (Changda 6 x MA 143) x Baisa 1016	yield earliness shortness
Shanyou 27	Shantou RIAS Guangdong Guandong	1985	cross Yuexuan 58 x Yueyou 320-14	uniform emergence rust resistance yield
Xianghua 1	Inst. of Crop Science Hunan AAS Hunan	1985	cross Yueyou 551 x Furong	earliness yield
Xianghuasheng 4	Inst. of Crop Science Hunan AAS Hunan	1996	gamma rays, 250 Gy [Xianghuasheng 2]	yield disease resistance
Yangxuan 1	Yangjian RIAS Guangdong	1978	cross Yueyou 1 x Yueyou 551	
Yeuyou 22	Inst. of Economic Crops Guangdong AAS Guandong	1968	cross Fushi x Fuhuasheng	dwarfness pod number yield
Yuexuan 58	Shantou RIAS Guangdong	1978	cross Yueyou 22 x Yueyou 431 (selection from Yueyou 551)	yield

Yueyou 169	Guangdong AAS Guangdong	1980	cross Yueyou 551-6 x 76/30	plant architecture leaf morphology yield
Yueyou 187	Guangdong AAS Guangdong	1981	cross (Yueyou 1 x Yangxuan 1) x Yueyou 551	tallness flower number pod size
Yueyou 187-93	Guangdong AAS Guangdong	1982	cross (Yueyou 1 x Yangxuan 1) x Yueyou 551	tallness flower number pod size
Yueyou 33	Inst. of Economic Crops Guangdong	1971	cross Fushi x Fuhuasheng (selection from Yueyou 22)	yield
Yueyou 551	Inst. of Economic Crops Guangdong AAS Guangdong	1972	cross Yueyou 22 x Yueyou 431	dwarfness pod number yield
Yueyou 551-116	Inst. of Economic Crops Guangdong AAS Guangdong	1975	cross Yueyou 22 x Yueyou 431 (selection from Yueyou 551)	yield earliness
Yueyou 551-38	South China Agric. College Guangdong	1975	cross Yueyou 22 x Yueyou 431 (selection from Yueyou 551)	yield
Yueyou 551-6	South China Agric. College Guangdong	1975	cross Yueyou 22 x Yueyou 431 (selection from Yueyou 551)	yield
Astragalus huangheensis	shadawang			
Heifu 2	Inst. of Animal Science Heilongjiang AAS Heilongjiang	1987	gamma rays, 180 Gy [domesticated Shadawang] grain yield	earliness yield
Heifu 4	Inst. of Animal Science Heilongjiang AAS Heilongjiang	1987	laser, 5 min. [domesticated Shadawang]	earliness yield
Heifu 21	Inst. of Animal Science Heilongjiang AAS Heilongjiang	1987	gamma rays, 180 Gy [domesticated Shadawang]	earliness seed setting
Penyangzaoshudawang	North-West Inst. Water Soil Cons. CAS, Jilin	1991	gamma rays, 500 Gy [Liaoningshadawang]	earliness

Zaoshushadawang	Inst. of Soil and Fertilizer Liaoning AAS Liaoning	1983	gamma rays, 500 Gy [Shadawang]	earliness yield adaptability
Beta vulgaris	sugar beet			
Tianyan 301	Inst. of Sugar Beet CAAS, Heilongjiang	1986	cross Tainyan 908 x 11032	quality disease resistance
Tianyan 302	Inst. of Sugar Beet CAAS, Heilongjiang	1989	cross Tianyan 408 x Tian 202	yield disease resistance
Boehmeria nivea	white ramie			
Xiangzhu 2	Inst. of Flax Crops CAAS	1987	gamma rays, 100 Gy [Xiangzhu 1]	yield disease resistance
Bougainvillea sp.	bougainvillea			
Suicheng 85-2	South China Agric. University Guangdong	1990	gamma rays, 35 Gy [Meiguihong]	flower colour flower duration
Yuehong 85-1	South China Agric. University Guangdong	1990	gamma rays, 30 Gy [Meiguihong]	flower colour flower duration
Brassica napus	rapeseed			
Ganyu 5	Inst. of Oilseed Crops CAAS, Hubei	1977	gamma rays, 1400 Gy [Shengliyoucai]	cold tolerance disease resistance yield
Huahuang 1	Inst. Crop Gen. & Breeding Huazhong Agric. University Hubei	1980	gamma rays	viability
Huyou 4	Shanghai AAS Shanghai	1970	gamma rays, 600 Gy [Shengliqinggeng]	lodging resistance pod number disease resistance
Xiangyou 11	Hunan AAS Hunan	1987	cross Malu x Guanyou 5	stress tolerance lodging resistance
Xinyou 1	Inst. of Economic Crops Xinjiang AAS Xinjiang	1979	gamma rays, 700 Gy [Baichenghuangyoucai]	seedling growth plant architecture stress tolerance

Xiuyou 1	Yichun RIAS Jiangxi	1978	gamma rays, 800 Gy [(Chuannongchangjiao x Qianyou 23)]	earliness adaptability yield
Zheyou 7	Zhejiang AAS Zhejiang	1983	cross 119 x (Jiangshanchangjia x 127)	earliness oil content
Brassica pekinensis	Chinese cabbage			
Baicai 9	Inst. of Horticulture Heilongjiang	1978	gamma rays, 800 Gy	earliness yield
Longbai 1	Inst. of Horticulture Heilongjiang AAS Heilongjiang	1984	gamma rays, 700 Gy [F4 line (Jiaoerye x Tongnong)]	earliness disease resistance storability
Longfuerniuxin	Heilongjiang AAS Heilongjiang	1991	gamma rays, 700 Gy [Xinnongerniuxin]	disease resistance yield
Longxiebai 1	Inst. of Horticulture Heilongjiang AAS Heilongjiang	1992	cross 78-23-2 x 006-7	earliness
Camelia sinensis	tea			
Fufeng	Inst. of Tea Hunan AAS Hunan	1997	gamma rays [Fudingdabeicha]	yield quality
Canna indica	canna lilies			
Caixiao	Shandong Agric. Univ. Shandong	1986	gamma rays, 9.2 Gy [Dahonghua (root)]	flower colour shortness
Caixui	Shandong Agric. Univ. Shandong	1986	gamma rays, 36.8 Gy [Dahonghua (root)]	flower colour
Huamei 1	Guangdong AAS Guangdong	1986	gamma rays	flower colour flower duration
Xuhong	Shandong Agric. Univ. Shandong	1986	gamma rays recurrent, 37.6 Gy + 36.8 Gy [Dahonghua (root)]	flower colour

Chrysanthemum sp.	chrysanthemum			
Angshoujingshi	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [Fengsehuan]	flower colour
Baiyunyong	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 30 Gy [Changfengwanli]	flower type flower petal
Chongyangshaoyao	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [Saishaoyao]	flower colour
Chuntao	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 25 Gy [Zihe]	flower colour flower petal
Fuchengzao	Inst. of Nuclear & Biotechnology Sichuan AAS Sichuan	1987	gamma rays, 40 Gy [Jiangchengluoxia]	photoperiod insensitivity earliness flower duration
Huangjuanyun	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 30 Gy [Chuntao]	flower colour flower petal
Jingguangsishe	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [Wuguangshise]	flower colour flower petal
Jingsuiqiu	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [011]	flower petal
Liangjihuang	Beijing Forestry University Beijing	1989	gamma rays, 30 Gy [Yaohong (leaf callus)]	flower colour flower petal number shortness
Mantianxin	IAAE Liaoning AAS Liaoning	1990	gamma rays, 30 Gy [104 Ju]	flower colour disease resistance drought tolerance
Sijifeng	Beijing Forestry University Beijing	1989	gamma rays, 30 Gy [Yaohong (leaf callus)]	flower colour flower petal number flower duration

Sijihong	Beijing Forestry University Beijing	1989	gamma rays, 30 Gy [Yaohong (leaf callus)]	flower colour flower petal number flower duration
Sijihuang	Beijing Forestry University Beijing	1989	gamma rays, 30 Gy [Yaohong (leaf callus)]	flower colour flower petal number flower duration
Sijimohong	Beijing Forestry University Beijing	1986	gamma rays, 30 Gy [Yaohong (leaf callus)]	flower colour flower petal number flower duration
Xishihanxiao	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 30 Gy [Chuntao]	flower colour flower petal
Xueyinghong	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 25 Gy [Daguangming]	flower type flower petal
Yaochuxuean	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [Fenggouhuan]	flower colour
Yingsidai	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 30 Gy [Fenggouhuan]	flower colour
Zitiane	IAAE Liaoning AAS Liaoning	1990	gamma rays, 20 Gy [104 Ju] drought tolerance	flower colour flower petal number
Zixia	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 30 Gy [Huangjingying]	flower colour
Ziyuntuoyue	Inst. of Isotopes Henan AS Henan	1991	gamma rays, 25 Gy [Shuangmantian]	flower type flower petal
Citrullus lanatus	watermelon			
Huozhou 1	Inst. of Horticulture Xinjiang AAS Xinjiang	1983	cross 20031 x Yichui	quality storability

Luxigua 1	Yexian IAS Shandong	1987	gamma rays [(Taojian 8 x Lemi 1)]	earliness disease resistance yield
Citrus sp.	orange/mandarin			
Hongju 418	Inst. of Orange CAAS, Zhongging	1983	gamma rays, 100 Gy [Dahongpaohongju (branch)]	seedless yield fruit quality
Hongju 420	Inst. of Orange CAAS, Zhongging	1986	gamma rays, 100 Gy [Dahongpao (branch)]	seed number cold tolerance
Xuegan 9-12-1	Inst. of Orange Guangxi	1983	gamma rays, 100 Gy [Xuegan (branch)]	seedless yield parthenogenesis
Zhongyu 7	Inst. of Orange CAAS, Zhongging	1985	gamma rays	seedless
Zhongyu 8	Guangdong AAS CAAS	1985	gamma rays	seedless
Colocasia esculenta	taro			
Luyutou 1	Laiyang College of Agric. Shandong	1993	gamma rays, 20 Gy [8501]	yield plant architecture taste
Corchorus capsularis	jute			
Xianghuangma 3	Inst. of Flax Crops CAAS	1997	gamma rays [Kuanyechangguo]	earliness seed quality
Coronilla varia	crown vetch			
Xifuxiaoguanhua	N-West Inst. of Water & Soil Cons. CAS, Jilin	1991	gamma rays, 600 Gy [Xidexaoguanhua]	toxin content yield
Cucumis sativus	cucumber			
Ludi 1	Inst. of Horticultural Crops Liaoning AAS Liaoning	1981	laser [Jinyan 1]	mildew resistance

Xianghuanggua 5	Inst of Horticulture Crops Hunan AAS Hunan	2000	cross	yield disease resistance
Dahlia sp.	dahlia			
Huanghuan	IAAE Jiangsu AAS Jiangsu	1989	gamma rays, 9.5 Gy + 46.5 Gy [Honghua (root + seed)]	shortness flower colour earliness
Meiguizi	IAAE Jiangsu AAS Jiangsu	1989	gamma rays, 9.5 Gy + 46.5 Gy [Honghua (root + seed)]	flower colour flower morphology earliness
Glycine max	soybean			
Anji 2	Anhui Agric. Univ. Anhui	1989	laser [hybrid]	oil content protein content adaptability
Fengdou 1	IAAE, Liaonjing AAS Liaonjing	1988	gamma rays, 200 Gy [F_2 (Qunxuan 1 x Qunjing) x 5621]	earliness yield
Fengshou 1	Keshan IAS Heilongjiang	1970	gamma rays, 140 Gy [Ke 56-4253]	earliness lodging resistance branching
Fengshou 22	Heilongjiang AAS Heilongjiang	1992	gamma rays, 160 Gy [Hejiao 77-153]	earliness stress tolerance
Hefeng 25	Hejiang RIAS Heilongjiang	1992	gamma rays, 160 Gy [Hejiao 77]	yield
Hefeng 33	Hejiang RIAS Heilongjiang	1992	thN, $1x10^{11}$ [Hejiao 8069]	disease resistance virus resistance
Hefeng 36	Hejiang RIAS Heilongjiang	1995	gamma rays, 80 Gy [hybrid]	earliness yield adaptability
Heihe 8	Heihe RIAS Heilongjiang AAS Heilongjiang	1989	fN, 2.27×10^{11} [Heijiao 75-327 strain]	adaptability grain morphology oil quality
Heihe 9	Heihe RIAS Heilongjiang AAS Heilongjiang	1990	fN, 1.3×10^{11} [Heijiao 7710 F_2]	stiffness yield protein content

Heihe 12	Inst. of Soybean Heilongjiang AAS Heilongjiang	1995	fN, $5x10^{11}$ [hybrid]	earliness yield
Heinong 4	Inst. of Soybean Heilongjiang AAS Heilongjiang	1966	gamma rays, 100 Gy [Mancangjing]	plant type
Heinong 5	Inst. of Soybean Heilongjiang AAS Heilongjiang	1967	gamma rays, 100 Gy [Dongnong 4]	root system internode length fertilizer response
Heinong 6	Inst. of Soybean Heilongjiang AAS Heilongjiang	1967	x-rays, 100 Gy [Mancangjing]	tallness drought tolerance
Heinong 7	Inst. of Soybean Heilongjiang AAS Heilongjiang	1967	x-rays, 100 Gy [Mancangjing]	branching pod number grain number
Heinong 8	Inst. of Soybean Heilongjiang AAS Heilongjiang	1967	x-rays, 100 Gy [Mancangjing]	earliness humidity tolerance
Heinong 16	Inst. of Soybean Heilongjiang AAS Heilongjiang	1970	gamma rays, 100 Gy [F3 (Wudingzhu x Jingshanpu)]	branching internode length drought tolerance
Heinong 28	Inst. of Soybean Heilongjiang AAS Heilongjiang	1986	fN, $5x10^{11}$ [F5 (Heinong 16 x Shengchangye)]	earliness stiffness protein content
Heinong 31	Inst. of Soybean Heilongjiang AAS Heilongjiang	1987	fN, $5x10^{11}$ [F4 (Ha 70-5075 x Ha 53)]	oil content disease resistance protein content
Heinong 32	Inst. of Soybean Heilongjiang AAS Heilongjiang	1987	fN, $5x10^{11}$ [F4 (Ha 70-5075 x Ha 53)]	oil content protein content disease resistance
Heinong 34	Inst. of Soybean Heilongjiang AAS Heilongjiang	1988	cross Heinong 16 x Tokachinogaha	yield protein content
Heinong 35	Inst. of Soybean Heilongjiang AAS Heilongjiang	1990	cross Heinong 16 x Tokachinogaha	yield protein content

Heinong 37	Inst. of Soybean Heilongjiang AAS Heilongjiang	1992	thN, 1x 10^{11} [hybrid]	earliness grain quality
Heinong 38	Inst. of Soybean Heilongjiang AAS Heilongjiang	1992	thN, 1x 10^{11} [hybrid]	lodging resistance yield
	Heilongjiang AAS Heilongjiang		Nongfu 73-8955 (gamma ray mutant of Fengshan) x Nongfuo 81-9825 (thN mutant)	protein content disease resistance
Heinongxiaolidou 1	Inst. of Soybean Heilongjiang AAS Heilongjiang	1989	fN [F_2 (7626 x 7634)]	grain weight disease resistance
Heinoun 26	Inst. of Soybean Heilongjiang AAS Heilongjiang	1975	cross Ha 2294 x Xiaojinhuang 1	plant architecture adaptability grain quality
Huayou 446	Shijiazhuang Inst of Agric. Modernization, CAS Heilongjiang	2001	0.2%DES + PYM, 2h [Jidou 4]	stress tolerance yield
Huayou 542	Shijiazhuang Inst of Agric. Modernization, CAS Heilongjiang	2000	0.2%DES + PYM, 2h [Jidou 4]	stress tolerance yield
Jidou 8	Shijianzhuang Inst of Agric Modernization, CAS Heilongjiang	1992	EMS + PMS, 0.8%; 1ppm [Zaoshu 10]	earliness grain morphology adaptability
Jiyuan 1	IAAE, Jilin AAS Jilin	1986	laser, 3 min. [Gongjiao 6514]	drought tolerance stress tolerance yield
Kefu 795-832	Inst. of Wheat Heilongjiang AAS Heilongjiang	1988	gamma rays + DES, 150 Gy [Fengshou 12]	tallness yield drought tolerance
Liaodou 3	IAAE, Liaoning AAS Liaoning	1983	cross 6405 x Amsuo	earliness lodging resistance disease resistance
Liaoduo 4	IAAE, Liaoning AAS Liaoning	1992	gamma rays [79 Hong-1]	protein content drought tolerance disease resistance
Liaodou 7	IAAE, Liaoning AAS Liaoning	1992	gamma rays, 180 Gy [hybrid]	disease resistance drought tolerance grain quality

Liaodou 9	IAAE, Liaoning AAS Liaoning	1993	gamma rays, 160 Gy [hybrid]	disease resistance grain quality yield
Liaodou 10	IAAE, Liaoning AAS Liaoning	1995	cross Liaodou 3 x Liao 825185	lodging resistance earliness yield
Liaodou 11	IAAE, Liaoning AAS Liaoning	1996	cross Liao 84063 x Liaodou 3	yield oil content
Liaonong 1	IAAE, Liaoning AAS Liaonjing	1988	gamma rays, 180 Gy [F_2 (Heinong 11 x Tiefeng 9)]	earliness yield
Ludou 9	Heze RIAS Shandong	1993	gamma rays, 180 Gy [(7528 x 7405)]	plant architecture grain quality disease resistance
Mufeng 6	Mudanjiang RIAS Heilongjiang AAS Heilongjiang	1987	gamma rays, 160 Gy [F_2 (Tielingduanyebin x Meiguokelake 63)]	earliness disease resistance protein content
Mushi 6	Mudanjiang Teachers College Heilongjiang	1980	gamma rays, 120 Gy [F_2 (Fengshu 10 x Jilin 3)]	earliness tallness yield
Ningzheng 3	Inst. of Economical Crops Jiangsu AAS Jiangsu	1993	gamma rays, 200 Gy [Ningzheng 1]	plant architecture grain morphology
Suilong 12	Suihua RIAS Heilongjiang AAS Heilongjiang	1996	gamma rays, 120 Gy [F6 (Suijio 83-432 x (Heihe 4 x Te 7604))]	yield
Tainung 1(R)		1962	thN	vigour non-shattering seed yield
Tainung 2(R)		1962	x-rays	vigour non-shattering seed adaptability

Tiefeng 18	Tieling RIAS Liaonjing	1973	gamma rays, 120 Gy [45-15 x 5621]	fertilizer response stiffness disease resistance
Tiefeng 19	Tieling RIAS Liaonjing	1974	gamma rays, 120 Gy [45-15 x 5621]	earliness fertilizer response yield
Tiefeng 24	Tieling RIAS Liaonjing	1988	cross Tiefeng 18 x Kaiyu 8	plant architecture lodging resistance
Wei 7610-13	Wei County Inst. Sci. & Tech. Hebei	1983	gamma rays + fN [Fengshouhuang]	earliness disease resistance yield
Wendou 79012	Wenniute Neimengu	1986	gamma rays	lodging resistance yield
Yedadou 2	Guangdong AAS Guandong	1990	gamma rays [(Williams x Sanledaqindou)]	disease resistance protein content
Yubian 30	Inst. of Genetics CAS, Beijing	1982	x-rays, 100 Gy [6825]	virus resistance yield
Yubian 31	Inst. of Genetics CAS, Beijing	1982	x-rays, 100 Gy [6825]	drought tolerance virus resistance
Yudou 4	Yanjing Henan	1987	gamma rays [Heidou]	disease resistance protein content
Yudou 9	Bureau of Agric. Henan	1989	gamma rays, 300 Gy [Shangqiu 7068]	yield plant type pest resistance
Zhangdou 1	Zhangwuxian IAS Liaonjing	1980	gamma rays [Tiefeng 18]	drought tolerance lodging resistance
Gossypium sp.	cotton			
113	Inst. of Cotton Shandong AAS Shandong	1985	gamma rays, 350 Gy [Liao 6496]	earliness better quality
Chuanpei 1	South-West Agric. Univ. Zhongging	1982	gamma rays [Dongtin 1]	earliness plant architecture elongated internode

Emian 15	Hubei AAS Hubei	1991	gamma rays, 300 Gy [Henan 75]	yield disease resistance
Jimian 8	Hubei AAS Hubei	1984	gamma rays, 300 Gy [hybrid]	earliness yield
Lumian 1	Inst. of Cotton Shandong AAS Shandong	1976	gamma rays, 400 Gy [F9 (Zhong 2 x 1195)]	plant architecture yield earliness
Xinhai 2	Inst. of Economic Crops Xinjiang AAS Xinjiang	1979	x-rays, 300 Gy [66-170]	plant architecture fibre quality Fusarium resistance
Yanmian 48	Yanhai RIAS Jiangsu	1985	cross 86-1 x Lumian 1	yield fibre quality
Yunfu 885	Inst. of Cotton Shanxi AAS Shanxi	1977	gamma rays, 150 Gy [Daizimian 15 x Xiaoyemian]	earliness boll number/yield fibre quality
Helianthus annuus	sunflower			
Jingkui 1	Shanxi Agric. University Shanxi	1987	fN, $5x10^{10}$ [Mokui]	earliness shortness
Hordeum vulgare	barley			
7938	Lixiahe RIAS Jiangsu	1984	gamma rays [Zaoshu 3]	earliness yield
Fuxuan 48	Inst. of Crop Science Shanghai AAS Shanghai	1985	gamma rays, 300 Gy [Zaoshu 3]	earliness shortness disease resistance
Jianghaidamei	Haian County IAS Jiangsu	1991	gamma rays + microwave [7422]	stress tolerance yield grain quality
Lupidamei 1	Shandong Agric. Univ. Shandong	1987	gamma rays, 300 Gy [Zaoshu 3]	photoperiod response lodging resistance yield
Qianlu 1	Shandong Agric. Univ. Shandong	1995	gamma rays, 300 Gy [Zaoshu 3]	disease resistance yield grain quality

Wandamei 1	Inst. of Crop Science Anhui AAS Anhui	1991	gamma rays, 300 Gy [Zaoshu 3]	grain weight
Yanfuaizao 3	Yanhai RIAS Jiangsu	1977	gamma rays, 250 Gy [Zaoshu 3]	earliness shortness yield
Wanshu S-367	Anhui AAS Anhui	1998	ion beams [83-367]	disease resistance yield
Yanshu 759	Yantai RIAS Shandong	1986	fN, $4x10^{11}$ [(Yanshu 3 x Xushu 18)]	starch content black spot resistance plant type
Yanshu 781	Yantai RIAS Shandong	1986	fN, $1x10^{12}$ [(Fengshouhuang x Honghong 1)]	starch content yield
Yushu 5	Nanyang RIAS Henan	1990	gamma rays + NaN_3 [(Yesheng x Lanyang 203)]	disease resistance yield
Linum usitatissimum	flax/linseed			
Heiya 4	Inst. of Sugarbeet Research Heilongjiang AAS Heilongjiang	1978	cross Gamma 671-681 x 6409-640	earliness lodging resistance salt tolerance
Heiya 6	Inst. of Economic Crops Heilongjiang AAS Heilongjiang	1985	cross gamma 7907-2-4 x Heiya 4	yield fibre quality salt tolerance
Heiya 7	Inst. of Economic Crops Heilongjiang AAS Heilongjiang	1989	cross 7106-3-6 x Gamma 7017-2-4	stress tolerance disease resistance lodging resistance
Lycopersicon esculentum	tomato			
Lufanqie 7	Yantai City AAS Shandong	1997	N^+ ion beams, 30kev [Xifeng 3]	earliness resisitance to TMV
Yufan 1	Inst of Horticulture Crops Heilongjiang AAS Heilongjiang	2000	areospace	earliness yield fruit quality

Malus sp.	apple			
Donghenghongpinguo	Inst. of Horticulture Qinghai AAS Qinghai	1987	gamma rays, 250 Gy [Jingguan (seed)]	shortness fruit colour fruit quality
Medicago sativa	alfalfa			
Xinmu 1	Bayi College of Agriculture Xinjiang	1986	gamma rays, 100 Gy	cold tolerance drought tolerance yield
Morus alba	mulberry			
Fusang 10	Inst. of Silk & Tea Jiangxi	1980	gamma rays	internode length leaf thickness leaf colour
Fuzaofeng	Inst. of Silk & Trade CAAS	1992	gamma rays, 5 Gy [Yu 151 (branch)]	earliness leaf quality disease resistance
Ji 7681	Inst. of Silk & Trade Sichuan AAS Sichuan	1988	laser [F_1 (Cangxi 49 x Yu 2)]	vigour leaf morphology leaf quality
Sangfu 1	Institute of Silk & Trade CAAS	1974	gamma rays, 75 Gy [Yizhilai]	internode length leaf morphology
Shannsang 871	Institute of Silk & Trade Shannxi	1994	gamma rays, 60 Gy [hybrid]	vigour yield
Shigu 11-6	Shantai Silk Production Farm Sichuan	1995	gamma rays, 100 Gy [Husang 32]	yield leaf quality adaptability
Nelumbo nucifera	lotus			
Dandinyuge	Inst. of Vegetable Crops Hunan AAS Hunan	1997	gamma rays [Xianbeilian 6]	flower colour flower petal type
Dianezhuang	Wuhan Inst. of Hortic. & Ornam. Hubei	1983	gamma rays [Beixianglian]	earliness

Ruyijiali	Inst. of Vegetable Crops Hunan AAS Hunan	1997	gamma rays [(Dongguali x Xianbeilian 6)]	flower colour flower petal type
Oryza sativa	rice			
202	Yueyang RIAS Hunan	1973	gamma rays, 200 Gy [IR 8]	leaf size panicle size
240	Lixiahe RIAS Jiangsu	1980	gamma rays, 300 Gy [Guangbeiguang]	earliness disease resistance
652	Hubei AAS Hubei	1979	gamma rays, 300 Gy [129 x Ewan 3]	blast resistance adaptability
1870	Lixiahe RIAS Jiangsu	1984	gamma rays, 200 Gy [Nanjing 33]	earliness yield grain quality
7404	Lixiane RIAS Jiangsu	1977	gamma rays, 350 Gy [Xinan 175]	shortness yield disease resistance
7738	Lixiahe RIAS Jiangsu	1980	gamma rays, 300 Gy [Guangbeiguang]	earliness yield pest resistance
69-280	Hunan AAS Hunan	1969	gamma rays, 300 Gy [Ainanzhao x Qingxiaojingzao]	earliness tillering
Aifu 9	Wenzhou RIAS Zhejing	1966	gamma rays, 300 Gy [Aijiaonante]	semi-dwarfness blast resistance yield
Ailiutiaohong	Fengxin County IAS Jiangxi	1989	gamma rays [Liutiaohong]	semi-dwarfness blast resistance yield
B-fu 1	Chiangsu County IAS Chiangsu	1982	gamma rays [(5450 x Yinnisuitiangu) BG 90-2]	shortness earliness grain size
Baofu 766	Guangxi College of Agric. Guangxi	1988	gamma rays, 50 Gy [Baoxuan 3 (PMC)]	earliness semi-dwarfness
Changwanxian	IAAE, Hunan AAS Hunan	1992	gamma rays, 300 Gy [hybrid]	cold tolerance yield

Changyouzao 1	IAAE, Hunan AAS Hunan	1995	gamma rays, 300 Gy [hybrid]	earliness yield grain quality
Chenzao 5	Chenzhou IAS Hunan	1979	gamma rays, 350 Gy [IR 8]	earliness tillering spike number
Dongting 3	Wuxi County Jiangsu	1976	gamma rays [Aixin 3]	semi-dwarfness stiffness yield
Ejingnuo 6	Jingzhou RIAS Hubei	1986	gamma rays, 350 Gy [Guizao 2]	blast resistance grain quality yield
Enuo 7	Jinzhou AAS Hubei	1994	cross BG 90-2 x 82033	disease resistance grain quality
Erfuzao	Wenzhou RIAS Zhejiang	1967	gamma rays, 300 Gy [Erjiuai 7]	earliness semi-dwarfness
Erjiufeng	Jiaxin RIAS Zhejiang	1985	cross Yuanfenzao x IR29	blight resistance earliness yield
Fu 709	Pinhu IAS Zhejiang	1974	gamma rays, 300 Gy [Nonghu 6]	yield cold tolerance
Fu 756	IAAE, Zhejiang AAS Zhejiang	1975	gamma rays, 300 Gy [Jiangerai]	disease resistance grain quality
Fu 769	IAAE, Zhejiang AAS Zhejiang	1976	gamma rays, 300 Gy [Jiangerai]	disease resistance yield adaptability
Fu 8970	IAAE, Zhejiang AAS Zhejiang	1995	cross Fu 8515 x Fu 9638	disease resistance
Fu 8-1	China Nat. Rice Res. Inst. Zhejiang	1988	gamma rays, 350 Gy [8004]	blast resistance yield grain quality
Fu 85-63	IAAE, Zhejiang AAS Zhejiang	1989	cross Fu 78-12 x IR 36	tillering type fertility increase cooking quality

Fubao 201	Pinnan County IAS Guangxi	1978	gamma rays, 300 Gy [Baoxuan 2]	earliness shortness disease resistance
Fuchuerai	Guangdong AAS Guandong	1978	cross IR 20 x Zhuyin C6965	shortness bact. leaf blight resistance
Fugui 1	Guangdong AAS Guandong	1980	gamma rays, 15 Gy [Guichao 2]	earliness shortness disease resistance
Fuheixiangnuo	Inst. of Nuclear Technology Sichuan	1993	gamma rays, 350 Gy [Nongqin 3]	earliness scent glutinous endosperm
Fuhui 06	Inst. of Nuclear Technology Sichuan	1983	gamma rays [Taiyin 1]	earliness restorer for hybrid
Fulianai	Zhejiang Agric University Zhejiang	1966	gamma rays, 200 Gy [Liantangzao]	semi-dwarfness blast tolerance
Fulianzao 3	Zhejiang AAS Zhejiang	1968	gamma rays, 300 Gy [Liantangzao]	earliness disease resistance shortness
Fuluzao 1	Guangdong AAS Guandong	1976	gamma rays [Guangdongai 4 x IR 8]	leaf size tillering earliness
Funuo 1	Inst. of Nuclear Technology Sichuan	1995	cross NA x Nuohui 1	earliness yield
Funuo 101	Inst. of Nuclear Technology Sichuan	1987	gamma rays, 300 Gy [Guichao 2]	earliness glutinous endosperm cont. disease resistance
Funuo 402	Inst. of Nuclear Technology Sichuan	1989	gamma rays [Guichao 2]	glutinous endosperm cont. yield
Fushe 31	Fujian AAS Fujian AAS	1966	gamma rays, 250 Gy [Lucaihao]	earliness shortness adaptability
Fushe 410	Sichuan AAS Sichuan	1974	gamma rays, 300 Gy [Chenai 8]	blast resistance

Fushe 94	Sichuan AAS Sichuan	1971	Neutrons, $3.5x10^{10}$ [Zhongaizi]	earliness tillering blast resistance
Fushenongken 58	Yueyang RIAS Hunan	1973	gamma rays, 300 Gy [Nongken 58]	disease resistance yield
Fuwan 23	IAAE, Hubei AAS Hubei	1978	gamma rays, 300 Gy [Huxuan 19]	disease resistance spike size grain quality
Fuwan 81-548	IAAE, Hubei AAS Hunan	1989	gamma rays, 300 Gy [Yuchi 231-8]	grain quality disease resistance lodging resistance
Fuxian 6	IAAE, Zhejiang AAS Zhejiang	1989	cross Fu 774 x IR 24	disease resistance yield
Fuxiang 1	Shandong AAS Shandong	1978	gamma rays + microwave, 300 Gy [Mingshuixiangdao]	earliness shortness cold tolerance
Fuxuan 1	Inst. of Nuclear Technology Sichuan	1968	gamma rays, 300 Gy [Zhongnong 4]	earliness salt tolerance adaptability
Fuxuan 124	Inst. of Nuclear Technology Sichuan	1972	gamma rays, 300 Gy [Guangxuan 3]	blast resistance earliness
Fuxuan 3	Inst. of Nuclear Technology Sichuan	1970	gamma rays, 300 Gy [Fuxuan 1]	tillering type blast resistance
Fuxuan 8	IAAE, Zhejiang AAS Zhejiang	1998	cross Fu 8329 x Fu 8105 x IR13471-74-1	blast resistance cold tolerance
Fuyou 63 (H)	Inst. of Nuclear Technology Sichuan	1993	Fu 74A x Fuhui 63-1	earliness yield
Fuyou 130 (H)	Inst. of Nuclear Technology Sichuan	1997	Fu 76A x 130	yield
Fuyou 802 (H)	Inst. of Nuclear Biotechnology Sichuan AAS Sichuan	1998	Fu 74A x Chuanfu 802	earliness yield
Fuyou 838 (H)	Inst. of Nuclear Technology Sichuan	1997	Fu 74A x Fuhui 838	earliness yield

Fuyouxiannuo	Inst. of Nuclear Technology Sichuan	1995	gamma rays, 280 Gy [Nongqin 2]	semi-dwarfness grain colour scent
Fuyu 1	Zhejian AAS Zhejiang	1968	gamma rays, 150 Gy [Erjiuai 7]	earliness disease resistance
Fuzao 2	Zhejiang Agric Univ. Zhejiang	1969	gamma rays, 300 Gy [Erjiuai]	earliness spike size
Fuzhou 383	IAAE, Hubei AAS Hubei	1989	cross Fuzhu x Yuanfengzao	plant architecture tillering
Fuzhu	IAAE, Hubei AAS Hubei	1979	gamma rays, 350 Gy [Zhulianai]	earliness cold tolerance blast resistance
Gang You 6 (H)		1985	Gangai A x Fuhui 06	fertility rate
Ganwannuo	Jiangxi AAS Jiangxi	1993	gamma rays, 300 Gy [SG 8960]	grain quality plant architecture disease resistance
Ganwanxian 23	IAAE, Jiangxi AAS Jiangxi	1994	cross TR 841 x M79215	grain quality disease resistance
Ganzaoxian 47	Fushun RIAS Jiangxi	2000	areospace [Zaoxian 86-70]	earliness shortness, yield
Gongshe 13	Jiangsu AAS Jiangsu	1969	gamma rays, 250 Gy [Laolaiqing]	disease resistance TKW
Guangdabai	Fujian AAS Fujian	1979	laser [Hong 410]	earliness yield panicle number
Guangfen 1	Zhejiang AAS Zhejiang	1977	laser [Guangluai 4]	earliness tillering shortness
Guangfu 1	Fuzhou IAS Fujian	1981	gamma rays + laser [Hong 410]	earliness tillering
Guifu 3	Fujian AAS Fujian	1973	gamma rays, 450 Gy [Guiluai 8]	earliness cold tolerance blast tolerance

Guifunuo	IAAE, Guizhou AAS Guizhou	1989	gamma rays, 300 Gy [Shuangchengnuo]	yield disease resistance grain quality
Guifuxian 2	Guizhou AAS Guizhou	1992	gamma rays, 300 Gy [83-231]	grain quality adaptability
Guiwanfu	Guangxi College of Agric. Guangxi	1988	gamma rays, 300 Gy [Baotaiai]	cold tolerance earliness shortness
Hangfeng	Inst. Of Crop Science Shanghai AAS Shanghai	1983	cross (Kenqui x Keqing 3) x Reimei	shortness tillering type grain quality
Hangyu 1	Crop Research Institute Zhejiang AAS	1998	aerospace [ZR 9]	earliness shortness
Heizhenmi	China National Rice Research Institute Zhejiang	1995	gamma rays, 15 Gy [Basmati 370, embryo culture]	black grain earliness
Hongfuzao 7	Inst. of Rice & Wheat Fujian AAS Fujian	1980	gamma rays, 300 Gy [Hong 410]	shortness panicle size
Hongnan	Guangxi AAS Guangxi	1981	gamma rays, 300 Gy [F_2 (Hongmeizao x Guanxi 1)]	earliness cold tolerance spike size
Hongtu 31	Zhoushan IAS Zhejiang	1985	electrons [Hong 410]	cold tolerance tillering type grain quality
Hu 2205	IAAE, Hubei AAS Hubei	1987	gamma rays, 10 Gy [IET 2938]	cooking quality lodging resistance
Huahang 2	Huanan Agric Univ Jiangxi	2000	areospace [Zaoxian 86-70]	yield grain quality
Huangpiai	Guangdong AAS Guangdong	1969	gamma rays, 300 Gy [Huangpizhong]	semi-dwarfness
Huayu 1	Taixin County IAS Jiangsu	1990	gamma rays	yield grain quality

II You 802 (H)	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1996	II 32A x Chuanhui 802	yield grain quality
II You 838 (H)	Inst. of Nuclear Technology Sichuan	1995	II 32A x Fuhui 838	earliness yield
Ⅱ You 3027 (H)	Inst. Nucl. Agric. Sci. Zhejiang University Zhejiang	2000	Ⅱ32A x R 3027	yield
Ikungbau 4-2		1973	x-rays [Ikungbau]	
Jiahezaozhan	Xiamen University Fujian	1997	gamma rays, 10 Gy (pollen)	grain quality yield
Jiasifu	Jiaxin RIAS Zhejiang	1973	gamma rays, 300 Gy [Jiahu 4]	earliness shortness tillering type
Jiguang 2	Hubei University Hubei	1977	laser [Guangluai 4]	shortness earliness
Jinfu 1	Inst. of Agric. Sciences Tianjin	1969	gamma rays, 300 Gy [Jinyin 37]	earliness blast resistance
Jinfu 48	Jinhua IAS Zhejiang	1988	gamma rays [Jinke 5]	yield
Jinfu 8	Inst. of Agric. Sciences Tianjin	1969	gamma rays, 300 Gy [Xiaozhan 101]	earliness semi-dwarfness blight resistance
Juanyebai	Inst. of Rice & Wheat Fujian AAS Fujian	1974	neutrons, $1x10^{12}$ [IR 8]	earliness tillering blast resistance
Kefuhong 2	Liancheng County IAS Fujian	1981	cross Mutant IR 8 x Hong 410	earliness blast resistance tillering type
KT 20-74		1957	x-rays [Ketze]	yield earliness
Liangyoupeijiu (H)	Jiangsu AAS Jiangsu	2000	Pei'ai 64S x Yangdao 6	grain quality yield

Liaofeng 5	Liaoning AAS Liaoning	1969	gamma rays, 200 Gy [Liaogeng 125]	earliness semi-dwarfness blast resistance
Liaoyan 2	Inst. of Sal. & Alk. Soil Util. Liaoning	1992	gamma rays [Toyonishiki]	salt tolerance
Lu 18S	Zhuzhou City IAS Hunan	2000	cross Kefuhong 2	earliness
M 112	Jiangxi AAS Jiangxi	1981	gamma rays, 300 Gy [5450 x Yinnishuitiangu]	cold tolerance Sogatella resistance yield
M 114	Jiangxi AAS Jiangxi	1981	gamma rays [(5450 x Yinnisuitiangu) BG 90-2]	cold tolerance Fulgorid resistance
Meisanwu 2	Guangdong AAS Guangdong	1990	gamma rays, 150 Gy [Aimeizao 3 x Waixuan 35]	disease resistance pest resistance
Minnuo 706	Fujian AAS Fujian	1991	gamma rays, 300 Gy [7056 x IR29]	tillering type glutinous endosperm cont. blast resistance
Minyuan 1	IAAE, Fujian AAS Fujian	1977	gamma rays, 300 Gy [Sanyeqi]	photonasty adaptability yield
Nangeng 23	Jiangsu AAS Jiangsu	1967	gamma rays, 250 Gy [20025] Xanthomonas resistance	shortness tillering
Nanhua 11	Tonglin County IAS Anhui	1987	pollen culture + laser [Nanyou 2]	yield blast resistance
Nanjing 34	Jiangsu AAS Jiangsu	1976	gamma rays + microwave [Zhaofeng]	shortness yield
Nanzao 1	Fujian AAS Fujian	1980	gamma rays, 300 Gy [Nanjing 11]	earliness panicle size adaptability
Nongshi 4	Fujian College of Agric. Sci. Fujian	1975	fN, $5x10^{11}$ [IR 20]	earliness cold tolerance Xanthomonas resistance

Qikesui	Heilongjiang AAS Heilongjiang	1986	gamma rays, 225 Gy [Hejiang 12]	cold tolerance stiffness vigour
Qinghuaai 6		1980	cross (Songhuaai x Fuchuerai) x F4 line	yield quality disease resistance
Qingwei 1	Guangdong AAS Guangdong	1985	gamma rays	yield disease resistance late season
Qiufu 1	Inst. of Rice, Guizhou AAS Guizhou	1982	gamma rays, 250 Gy [Qiujuai]	cold tolerance adaptability tillering
Quannuo 101	Quanzhou AAS Fujian	1990	gamma rays, 200 Gy [hybrid]	yield glutinous endosperm cont.
R 462	IAAE, Jiangsu AAS Jiangsu	1985	gamma rays, 20 Gy [501 Xuan (pollen)]	shortness yield plant architecture
R 817	IAAE, Zhejiang AAS Zhejiang	1987	gamma rays, 300 Gy [Aishungnuo]	glutinous endosperm cont. yield blast resistance
SH 30-21		1957	x-rays [Shungchiang]	yield earliness
Shanyou 371 (H)	INAS, Zhejiang University Zhejiang	1998	Zhenshian 97A x Zuhui 371	grain quality yield
Shanyou 36 Fu (H)	Wenzhou RIAS Zhejiang	1984	Zhenshan 97A x IR 36 Fu	earliness
Shenxiangjing	Shanghai AAS Shanghai	1994	x-rays, 95 Gy	blast resistance shortness grain quality
Shuangchengnuo	Jiangsu AAS Jiangsu	1980	gamma rays, 300 Gy [2004]	compact growth stiffness taste
Shuangchiang 30-21	Taiwan	1957	x-rays [Shuangchiang]	yield earliness

Shuangfu 1	Chuxian IAS Anhui	1989	gamma rays, 350 Gy [Guichao 2]	shortness earliness grain quality
Shuangke 1	Zhejiang Agr. Univ. Zhejiang	1981	cross IR 24 x Kefuzao	earliness yield heat tolerance
Sifu 851	Inst. of Nucl. Agr. Sci. Zhejiang Agric. University Zhejiang	1985	cross Guoji 24 x Zhefu 802	earliness yield grain size
Suifu 17	Liuzhou RIAS Guangxi	1979	gamma rays, 300 Gy [Suiya 156]	shortness yield
Suiwan 2	Suixian IAS Hubei	1974	gamma rays, 300 Gy [Huxuan 19]	tillering type stiffness
Taifu 4	Jiangchuan County Yunnan	1979	gamma rays, 200 Gy [Taizhong 3]	disease resistance fertilizer response
Tangernian	Guangdong AAS Guangdong	1985	gamma rays	yield disease resistance late season variety
Vyouwan 3 (H)	Hunan Hybrid Rice Centre Hunan	1994	V 20A x Wan 3	yield grain quality
Wandao 20	Rice Research Institute Anhui AAS Anhui	1994	ion beams [Eyu 105]	grain quality fertilizer response
Wandao 25	Chuxian RIAS Anhui	1990	gamma rays, 294 Gy [Minggui 1 x Simei 2]	earliness disease resistance lodging resistance
Wandao 42	Rice Research Institute Anhui AAS Anhui	1997	ion beams [Taiwanzhongjing]	earliness blight resistance
Wandao 44	Rice Research Institute Anhui AAS Anhui	1997	ion beams [hybrid]	yield
Wandao 45	Rice Research Institute Anhui AAS Anhui	1994	ion beams [Zhefu 15]	earliness blight resistance

Wandao 51	Rice Research Institute Anhui AAS Anhui	1997	gamma rays, 300 Gy [hybrid]	yield
Wanfu 33	Wanxian RIAS Sichuan	1980	gamma rays, 300 Gy [72-10]	earliness blast resistance
Wanfu 8818	Chuzhou IAAE Anhui	1997	gamma rays, 340 Gy [Yaodao 4]	yield disease resistance
Wanjing 257	Hubei AAS Hubei	1975	gamma rays, 300 Gy [Huxuan 19]	fertilizer response blast resistance yield
Wanhongfu	Jinxi County IAS Guangxi	1980	gamma rays, 350 Gy [25-1 x Hongmiyouzhan]	cold tolerance disease resistance adaptability
Wanhua	Guangdong AAS Guangdong	1983	cross Qinghuaai 6 x Qinglian 32	semi-dwarfness disease resistance grain quality
Wanjing 3073	IAAE, Hubei AAS Hubei	1990	gamma rays, 300 Gy [Sujing 7 x Ewan 5]	fertilizer response panicle size yield
Weiyouji (H)	Dept. of Biology Hubei University Hubei	1983	V 20A x Jiguang 4	earliness yield
Xangzaonuo 1	IAAE, Hunan AAS Hunan	1984	gamma rays [F_2 (IR 29 x Wenqingxuan)]	glutinous endosperm cont. yield disease resistance
Xiangfudao	Hunan AAS Hunan	1976	gamma rays, 300 Gy [Erjiuqing]	cold tolerance blast resistance Xanthomonas resistance
Xianghu 24	Jiaxin RIAS Zhejiang	1984	cross (Funong 709 x Jingyin 154) x Funong 709	blast resistance daylength insensitivity glutinous endosperm cont.
Xianghu 47	Jiaxin RIAS Zhejiang	1985	cross Jiahu 4 x Jian 3 x Funong 709 x Jiangyng 154	panicle size grain size yield
Xianghu 93	Jiaxin RIAS Zhejiang	1984	cross (Funong 709 x Jingyin 154) x Funong 709	lateness disease resistance

Xiangjing 832	Crop Research Institute Shanghai AAS Shanghai	1989	x-rays, 95 Gy [Wuxiang 203 (germinating seed)]	shortness blast resistance yield
Xiangwanxian 7	Rice Research Institute Hunan AAS Hunan	1996	cross Caimoji 22 x Hongtu 5 Hongtu 5	blast resistance yield
Xiangzaoxian 18	IAAE, Hunan AAS Hunan	1995	gamma rays, 300 Gy [hybrid]	earliness grain quality
Xiangzaoxian 20	IAAE, Hunan AAS Hunan	1995	gamma rays, 300 Gy [hybrid]	earliness grain quality blight resistance
Xiangzaoxian 21	IAAE, Hunan AAS Hunan	1996	gamma rays + laser, 288 Gy [Xiangaizao 7]	blight resistance yield
Xiangzaoxian 22	Huaihua City IAS Hunan	1996	cross Huai 4333 x Zhefu 802	grain quality yield
Xiangzaoxian 23	Zhuzhou City IAS Hunan	1997	cross Xiangzaoxian 7 x Zhefu 9	earliness yield
Xiangzaoxian 25	Xiangtan City IAS Hunan	1997	cross Zhe 733 x Fu 26	shortness disease resistance
Xiangzaoxian 28	Hunan Agric. University Hunan	1999	chemical mutagen [Zhe 733]	earliness yield
Xiangzaoxian 8	Hunan College of Agric. Hunan	1988	laser [Xiangaizao 9]	earliness yield grain quality
Xiangzaoxian 9	Chenzhou RIAS Hunan	1989	gamma rays, 330 Gy [Hongtu 5]	earliness yield grain quality
Xiaofuzao	Xiaogan IAS Hubei	1974	gamma rays, 300 Gy [Liantangzao]	earliness shortness
Xieyou 371 (H)	INAS, Zhejiang University Zhejiang	1999	Xieqingzao A x Zuhui 371	earliness grain quality
Xieyou 36 Fu (H)	Wenzhou RIAS Zhejiang	1986	Xieqingzao A x ZR 36 Fu	earliness

Xindao 1	IAAE, Xinjiang AAS Xinjiang	1986	gamma rays, 187 Gy [F_2 (Ningxi 62-2 x Panjin 1)]	earliness yield grain quality
Xiongyue 613	Xunyue RIAS Liaoning	1970	gamma rays, 150 Gy [Nongken 20]	blast resistance yield grain quality
Xiushui 04	Jiaxin RIAS Zhejiang	1985	cross Ze 21/ Funong 709/ Dan 209	earliness disease resistance
Xiushui 06	Jiaxin RIAS Zhejiang	1984	cross Funong 709 x Dan 209	earliness yield
Xiushui 48	Jiaxin RIAS Zhejiang	1984	cross Funong 709 x Jingyin 154	blast resistance yield
Xiuxui 117	Jiaxin RIAS Zhejiang	1984	cross Funong 709/ Zaison/ Funong 709/ Chengbaoxifeng	earliness disease resistance panicle size
Yangdao 6	Lixiahe RIAS Jiangsu	1997	gamma rays, 300 Gy [F_1 Yangdao 4 x 3021]	yield disease resistance
Yangfunuo 1	Lixiahe RIAS Jiangsu	1990	gamma rays, 300 Gy [IR 29]	earliness yield disease resistance
Yangfuxian 2	Lixiahe RIAS Jiangsu	1991	gamma rays, 300 Gy [IR 1529-68-3-2]	yield disease resistance grain quality
Yangfuxian 3	Lixiahe RIAS Jiangsu	1993	gamma rays, 300 Gy [IR 2415]	blast resistance yield
Yangfuxian 5	Lixiahe RIAS Jiangsu	2000	gamma rays, 300 Gy [Yangdao 6]	cooking quality blast resistance
Yanzhengfu	Longyan RIAS Fujian	1979	gamma rays, 300 Gy [Longzhen 13]	yield
Yenhsing-1		1963	cross Taichung N 1 x SH 30-21 Note: Yenhsing-1 = YH 1 (MBRW 61)	yield earliness
Yenhsing-2		1967	cross Taichung N 1 x KT 20-74	erectoid type

Yifunuo 1	Yibin RIAS Sichuan	1977	gamma rays, 100 Gy [IR 8]	blast resistance spike size grain number
Youfu 5	Fujian AAS Fujian	1980	gamma rays, 200 Gy [Siyou 2]	earliness panicle size grain number
Yuanfengzao	IAAE, Zhejiang AAS Zhejiang	1975	gamma rays, 300 Gy [IR 8]	earliness yield adaptability
Yangfunuo 4	Lixiahe RIAS Jiangsu	2000	gamma rays, 300 Gy [IR 1529-68-3-2]	glutinous endosperm yield
Yuanjing 2	IAAE, Zhejiang AAS Zhejiang	1988	gamma rays, 350 Gy [Nonghu 6]	yield earliness blast resistance
Yuanjing 4	IAAE, Zhejiang AAS Zhejiang	1993	gamma rays, 300 Gy [Xiushui 14 x Xiushui 27]	blast resistance earliness yield
Yuanjing 7	IAAE, Zhejiang AAS Zhejiang	1999	gamma rays, 300 Gy [F_1 R9063 x Xiushui 861]	grain quality blight resistance
Yuanjing 11	IAAE, Zhejiang AAS Zhejiang	1990	gamma rays [R 824 x C 8046]	earliness disease resistance
Zaoyeqing	Fujian AAS Fujian	1980	gamma rays, 200 Gy [Zaoyeqing 8]	panicle size heat tolerance
Zhe 852	Crop Research Institute Zhejiang AAS Zhejiang Agric. Univ.	1989	gamma rays, 300 Gy [Zhefu 802 x Shuiyuan 290]	blast resistance earliness yield
Zhefu 7	Inst. Nucl. Agric. Sci. Zhejiang Agr. Univ. Zhejiang	1991	gamma rays, 300 Gy [Erjiufong]	earliness cold tolerance yield
Zhefu 9	Inst. Nucl. Agric. Sci. Zhejiang Agric. Univ. Zhejiang	1990	cross IR 50 x 44-1086	yield disease resistance
Zhefu 218	Inst. Nucl. Agric. Sci. Zhejiang University Zhejiang	1995	cross Fu 9 x BG 910E	earliness grain quality yield

Zhefu 504	Inst. Nucl. Agric. Sci. Zhejiang University Zhejiang	1999	gamma rays, 300 Gy [F_1 Zhenong 8010 x G 88-294]	earliness yield grain quality
Zhefu 762	Inst. Nucl. Agric. Sci. Zhejiang Agr. Univ. Zhejiang	1993	cross IR 50 x 44-1086	disease resistance cold tolerance yield
Zhefu 802	Inst. Nucl. Agric. Sci. Zhejiang Agric. Univ. Zhejiang	1981	gamma rays, 300 Gy [Simei 2]	earliness yield disease resistance
Zhefu 910	Inst. Nucl. Agric. Sci. Zhejiang University Zhejiang	2000	cross Zhefu 219 x CSR 2	yield disease resistance
Zhenfu 1	Guangxi AAS Guangxi	1971	gamma rays, 300 Gy [Zhenshuai]	earliness tillering type stiffness
Zhengguang 1	Qichun County Hubei	1979	gamma rays, 300 Gy [Taizhongyu 39]	YDV resistance
Zhenuo 2	IAAE, Zhejiang AAS Zhejiang	1993	gamma rays, 300 Gy [R8917]	blast resistance earliness yield
Zhongzu 1	China Nat. Rice Res. Inst. Zhejiang	2000	gamma rays, 15 Gy [Basmati370 – embryo culture]	cooking quality yield
Zhong 156	China Nat. Rice Res. Inst. Zhejiang	1993	cross Zhefu 802 x Zaoxuan 1	yield
Zhongbao 2	South China Inst. of Botany Guandong	1977	fN, 2.5x10-11	earliness shortness
Zhongmounuodao	Zhongmou County Henan	1982	gamma rays, 250 Gy [Tianbian 10]	glutinous endosperm cont. grain quality stress tolerance
Zhongtie 31	Experimental Institute Guangdong	1986	fN, 1.33 - 3.33 x 10^{11} [Tieqiu 15]	yield adaptability
Zhongzhe 1	1989 Zhejiang AAS Zhejiang	cross	yield IR 24 x Yuanfengzao x Zhuke 2	

Zhouyou 903	Zhoushan RIAS Zhejiang Province	1994	cross Hongtu 80 x 412	grain quality
Zhuchou 40	Huizhou IAS Anhui	1978	gamma rays, 300 Gy [F_2 (Zhulianai x Qiuzhen)]	cold tolerance adaptability blast resistance
Zijiangnuo	Inst. of Food Crops Jiangsu AAS Jiangsu	1984	cross Fuhong 3 x Xinbasi x Nenjing 15 gamma	yield blast resistance
Zixiangnuo 861	Crop Research Institute Shanghai AAS Shanghai	1989	x-rays, 100 Gy [Lungjing 2 (germinating seed)]	shortness yield
Phaseolus vulgaris.	common bean			
Longyundou 4	Inst. of Crop Science Heilongjiang AAS Heilongjiang	1994	gamma rays, 200 Gy [Heiyundou]	yield disease resistance grain quality
Pisum sativum	pea			
Caoyuan 10	Inst. of Crop Science Qinhai AAS Qinhai	1984	gamma rays, 200 Gy [Lusecaoyuan]	earliness drought tolerance disease resistance
Prunus persica	peach			
Shaji 1	Yunnan Agric Univ Yunnan	1985	CO_2 lasers [ms Shazizaosheng]	lateness yield fruit quality
Shaji 2	Yunnan Agric Univ Yunnan	1985	CO_2 lasers [ms Shazizaosheng]	earliness yield fruit quality
Pyrus communis	pear			
Chaofu 1	Inst. of Horticulture Neimenggu	1989	gamma rays, 2.5 Gy [Chaoxianyangli]	shortness quality
Chaofu 2	Inst. of Horticulture Neimenggu	1989	gamma rays, 2.5 Gy [Chaoxianyangli]	quality fruit morphology

Chaofu 10	Inst. of Horticulture Neimenggu	1989	gamma rays, 2.5 Gy [Chaoxianyangli]	quality fruit morphology fruit scent
Chaofu 11	Inst. of Horticulture Neimenggu	1989	gamma rays, 2.5 Gy [Chaoxianyangli]	lateness storablity quality
Fuxiangyanghongdli	Inst. of Horticulture Neimenggu	1983	gamma rays [Xiangyanghong]	disease resistance quality
Raphanus sativus	radish			
Qingfu	Inst. of Horticulture Qinghai AAS Qinghai	1981	gamma rays, 800 Gy [Luoyanglutouqing]	yield root size sugar content
Rosa sp.	rose			
Beijingzhichun	Inst. of Vegetables and Flowers CAAS, Beijing	1990	gamma rays, 50 Gy [Hongyizhujiao x Hongchenggong (F_1 seed)]	flower colour flower scent flower morphology
Beiyumudan	Inst. of Isotopes Henan AS Henan	1986	gamma rays, 40-50 Gy [Yilishahuanghou (branch)]	flower colour flower petal type
Binghua	Inst. of Vegetables and Flowers CAAS, Beijing	1986	gamma rays, 30 Gy + 50 Gy [Beixuaishai x Wuhui (branch & seeds)]	flower colour flower morphology plant type
Caiyemingxin	Inst. of Isotopes Henan AS Henan	1986	gamma rays, 40 Gy [Mingxin (branch)]	leaf morphology flower colour
Chuanxiu 1	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays chronic, 7 Gy [Yangjige (rooted cuttings)]	flower colour flower duration sunlight tolerance
Chuanxiu 2	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 40 Gy [Yangjige (young graft)]	flower colour flower duration disease resistance
Chuanxiu 3	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 40 Gy [Yangjige (rooted cuttings)]	flower colour flower duration disease resistance

Chuanxiu 4	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 68 Gy [Guanghui (rooted cuttings)]	flower colour
Chuanxiu 5	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 68 Gy [Guanghui (young graft)]	flower colour
Chuanxiu 6	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 58 Gy [Yilishabei (rooted cuttings)]	flower colour flower duration
Chuanxiu 7	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1990	gamma rays, 40 Gy [Tengheping (graft)]	flower colour disease resistance
Chunyanqifei	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 40-50 Gy [Ai (branch)]	flower colour
Haleihuixin	Inst. of Vegetables and Flowers CAAS, Beijing	1985	gamma rays, 30 Gy + 50 Gy [Zhandihuanghua x Haixia (branch & seeds)]	flower colour sunlight tolerance flower duration
Hepingzhiguang	Inst. of Isotopes Henan AS Henan	1986	gamma rays, 40-50 Gy [Heping (branch)]	flower colour flower petal colour
Hongdu	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy + 50 Gy [Lanxia x Lanyue (branches & seeds)]	flower colour sunlight tolerance
Honghuo	Inst. of Vegetables and Flowers CAAS, Beijing	1986	gamma rays, 30 Gy + 50 Gy [Ouxiliya x Guonong (branch & seeds)]	flower colour sunlight tolerance root system
Hongyu	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 40-50 Gy [Lushimei (branch)]	flower colour flower morphology
Huangjiao	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 40-50 Gy [Yalishanda (branch)]	flower colour
Jiguang	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy [Fengheping (branch)]	flower colour

Jubian	Inst. of Vegetables and Flowers CAAS, Beijing	1990	gamma rays, 30 Gy [Mubiao]	flower colour plant type disease resistance
Jujing	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 gy + 50 Gy [Mohong x Guonong (branch & seeds)]	flower scent flower colour
Lihui	Inst. of Vegetables and Flowers CAAS, Beijing	1985	gamma rays, 30 Gy [Rongguang (branch)]	flower colour
Lubaoshi	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy + 50 Gy [Beixuaishan x Shiwaitaoyuan (branch & seeds)]	sunlight tolerance flower colour flower duration
Luxin	Inst. of Vegetables and Flowers CAAS, Beijing	1990	gamma rays, 40 Gy [Beixueshan x Luyun (F_1 seed)]	flower colour flower scent flower duration
Luye	Inst. of Vegetables and Flowers CAAS, Beijing	1987	gamma rays, 30 Gy + 50 Gy [Beixuaishan x Dajiangzhang (branch & seeds)]	flower colour flower duration leaf colour
Nanhailanghua	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy [(Langhua x Nanghai)]	flower colour
Qingchunshihuo	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 40-50 Gy [Yan (branch)]	leaf morphology
Shouhong	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy + 50 Gy [Mohong x Heping (branch & seeds)]	flower colour sunlight tolerance flower duration
Xiaguangwandao	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy [Lushimei (branch)]	flower colour flower morphology
Xinchao	Inst. of Vegetables and Flowers CAAS, Beijing	1990	gamma rays, 30 Gy + 50 Gy [Yidenjing x Yitongji (branch & seeds)]	flower colour flower scent
Yanhong	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy + 50 Gy [Mohong x Huancai (branch & seeds)]	flower duration sunlight tolerance
Zhaoyang	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy + 50 Gy [Yanyangtian x Dajiangzhang (branch & seeds)]	flower colour
Zhengzhoudajiangzhang	Inst. of Isotopes Henan AS Henan	1986	gamma rays, 40-50 Gy [Dajiangzhang (branch)]	flower colour flower number vigour

Zhengzhouchunse	Inst. of Isotopes Henan AS Henan	1989	gamma rays, 40-50 Gy [Yalishanda (branch)]	flower colour
Zhenjie	Inst. of Vegetables and Flowers CAAS, Beijing	1984	gamma rays, 30 Gy [Xinyong (branch)]	flower colour flower scent
Saccharum officinarum	sugarcane			
Guifu 80-29	Inst. of Sugarcane Guangxi AAS Guangxi	1989	gamma rays, 80 Gy [Guitang 72-28]	earliness stalk size sugar content
Yuetangfu 83-5	Sugarcane Industry Research Institute Guangzhou, Guangdong	1992	gamma rays + fN [Yuetang 71-210]	sugar content
Sesamum indicum	sesame			
Ningya 10	Guyan RIAS Ningxia	1982	gamma rays, 100 Gy [Yanza 10]	earliness lodging resistance seed quality
Setaria italica	foxtail millet			
Lugu 7	Inst. of Crop Science Shandong AAS Shandong	1987	gamma rays, 372 Gy [Lugu 2]	shortness lodging resistance yield
Setaria sp.	millet			
Angu 221	Anyang RIAS Henan	1978	gamma rays, 400 Gy [Ange 4]	earliness seed setting grain size
Changwei 74	Changwei RIAS Shandong	1974	gamma rays, 350 Gy [Shuilihun]	glutinous endosperm cont. earliness disease resistance
Changwei 75	Changwei RIAS Shandong	1975	gamma rays, 350 Gy [Changwei 69]	blast resistance seed quality
Chigu 4	Chifeng IAS Liaoning	1987	fN [Shaogu 1]	grain quality drought tolerance disease resistance

Fugu 3	North-W. Inst. of Water & Soil Cons. CAS, Jilin	1989	gamma rays, 300 Gy [Honggu]	yield disease resistance
Fugu 4	North-W. Inst. of Water & Soil Cons. CAS, Jilin	1992	gamma rays, 300 Gy [Honggu]	yield grain quality
Fugu 6	North-W. Inst. of Water & Soil Cons. CAS, Jilin	1999	gamma rays, 250 Gy [Fugu 3]	lodging resistance drought tolerance grain quality
Jingu 15	Inst. of Millet Shanxi AAS Shanxi	1981	gamma rays, 400 Gy	earliness yield grain quality
Jingu 21	Inst. of Economic Crops Shanxi AAS Shanxi	1991	gamma rays, 350 Gy	lodging resistance drought tolerance quality
Longgu 27	Inst. of Crop Breeding Heilongjiang AAS Heilongjiang	1988	fN, $1x10^{12}$ [Lanfan 1]	panicle size disease resistance grain quality
Longgu 28	Inst. of Crop Breeding Heilongjiang AAS Heilongjiang	1989	fN, $7x10^{11}$ [Yuan 1246]	drought tolerance disease resistance grain quality
Longgu 29	Heilongjiang AAS Heilongjiang	1992	fN, $7x10^{11}$ [Ji 1246]	lodging resistance disease resistance
Lugu 2	Inst. of Economic Crops Shanxi AAS Shanxi	1991	gamma rays, 400 Gy [Jinfeng 69]	yield disease resistance grain quality
Nenxuan 11	Nenjiang RIAS Heilongjiang AAS Heilongjiang	1985	cross Liusibei x 72-9012	drought tolerance cold tolerance disease resistance
Nenxuan 12	Nenjing RIAS Heinongjian AAS Heilongjiang	1986	fN, $5x10^{12}$ [Xiaoyijiu]	drought tolerance mildew resistance
Nenxuan 14	Nenjiang RIAS Heilongjiang AAS Heilongjiang	1992	gamma rays, 250 Gy [hybrid]	lodging resistance drought tolerance grain quality
Yugu 6	Inst. of Food Crops Henan AAS Henan	1995	cross 78-gamma-Zheng- 4 x 7519	disease resistance stress tolerance protein content

Zhangnong 10	Zhangjiakou RIAS Hebei	1966	gamma rays, 250 Gy [Hongshizhu]	grain morphology earliness shortness
Zhangnong 11	Zhangjiakou RIAS Hebei	1966	gamma rays, 250 Gy [Hongshizhu]	logging resistance panicle size productivity
Zhufu 1	IAAE, CAAS Beijing	1974	gamma rays [Moligu]	adaptability grain quality
Sorghum bicolor	sorghum			
Jinfu 1	Inst. of Economic Crops Shanxi AAS Shanxi	1970	gamma rays, 240 Gy [Jingza 5]	grain quality combining ability
Jinza 1	Inst. of Economic Crops Shanxi AAS Shanxi	1973	cross 3197A x Jinfu 1 Jinfu 1	lodging resistance yield adaptability
Longfuliang 1	IAAE Heilongjiang AAS Heilongjiangadaptability	1979	gamma rays, 200 Gy [Xinliang 7]	earliness shortness
Triticum aestivum	wheat			
092	South-West College of Agriculture Sichuan	1966	gamma rays [Nanda 2419]	earliness yield disease resistance
1161	Hubei AAS Hubei	1966	gamma rays, 300 Gy [Nanda 2419]	cold tolerance shortness tillering type
352	IAAE Zhejiang AAS Zhejiang	1983	laser, 50 J [470]	earliness Gibberella tolerance yield
503	IAAE Zhejiang AAS Zhejiang	1975	gamma rays, 300 Gy [Jiulan]	tillering type cold tolerance adaptability
62-10	Inst. of Crop Science Qinghai AAS Qinghai	1985	fN [Abbodanza]	rust resistance shortness

62-8	Inst. of Crop Science Qinghai AAS Qinghai	1985	fN [Abbodanza]	rust resistance earliness
77 L15	Inst. of Food Crops Shanxi AAS Shanxi	1983	laser [F_1 (Zhengyin 1 x Shangjian)]	stiffness disease resistance spike size
78 A	Inst. of Cotton Shandong AAS Shandong	1986	gamma rays, 250 Gy [-]	grain quality yield
Changwei 19	Changwei RIAS Shandong	1978	gamma rays, 350 Gy [Maoyinafu]	disease resistance salt tolerance stiffness
Changwei 20	Changwei RIAS Shandong	1978	gamma rays, 350 Gy [Maoyinafu]	disease resistance tillering type cold tolerance
Changwei 51503	Changwei RIAS Shandong	1983	gamma rays, 350 Gy [Xiangyang 1 x Heimangmai]	tillering type cold tolerance salt tolerance
Chuanfu 1	IAAE Sichuan AAS Sichuan	1982	beta rays, 10µc/grain [Chuanyu 5]	earliness adaptability disease resistance
Chuanfu 2	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1989	gamma rays, 200 Gy [F_1 (Chuanfu 1 x 78-2882)]	disease resistance yield earliness
Chuanfu 3	Inst. Nuclear Biotechnology Sichuan AAS Sichuan	1989	gamma rays, 200 Gy [F_1 (Bamai 18 x 79P-600)]	disease resistance yield winter hardiness
Chuanfu 4	Inst. of Nuclear Biotechnology Sichuan AAS Sichuan	1993	gamma rays, 200 Gy [(Chuanfu 1x 78-2882)]	yield adaptability
Emai 6	Hubei AAS Hubei	1966	gamma rays, 300 Gy [Nanda 2419]	rust resistance yield adaptability
Emai 9	Hubei AAS Hubei	1980	gamma rays [selected line from Emai 6]	Gibberella tolerance salt tolerance adaptability

Fuer	Zhangye RIAS Gansu	1977	gamma rays, 160 Gy [Keshibaipi x 774 Strain]	rust resistance mildew resistance stress tolerance
Fuou 1	Yunnan AAS Yunnan	1974	gamma rays [Ourou]	rust resistance
Fusheabo 1	Crop Research Inst. Qinghai AAS Qinghai	1987	fN, $6x10^{11}$ [Abo]	rust resistance tillering type
Ganchun 20	Gansu Agric. Univ. Gansu	1998	gamma rays, 150 Gy [hybrid]	grain quality yield
Guifu 12	IAAE Guizhou AAS Guizhou	1986	cross Xinke 15 x Afunuoer	rust resistance
Heichun 2	Heihe RIAS Heilongjiang	1979	cross Nongken 149 x Xinshuguang 1	earliness stiffness rust resistance
Henong 1	Inst. of Nucl. Agr. Sci. Zhejiang Agric. Univ. Zhejiang	1985	gamma rays [Yangmai 1]	yield stiffness shortness
Hezu 8	Inst. Nucl. Agr. Sci. Zhejiang Agr.Univ. Zheijiang	1992	gamma rays, 10 Gy [Zhemai 908 (immature embryo)]	yield earliness scab resistance
Humai 3	Shanghai AAS Shanghai	1978	gamma rays, 250 Gy [Yangmai 1]	earliness grain weight protein content
Jiaxuan 1	Jiaxiang County Shandong	1974	gamma rays [Maoyingafu]	salt tolerance cold tolerance disease resistance
Jinmai 2	Shanxi AAS Shanxi	1970	gamma rays, 200 Gy [Beijing 6]	earliness drought tolerance rust resistance
Jihe 02	Inst. of Crop Science Shandong AAS Shandong	1993	cross (Tai x Fu 63) x 775-1	drought tolerance yield

Jimai 28	Tangshan RIAS Hebei	1988	gamma rays [Fanxiu 4]	cold tolerance disease resistance yield
Jinfen 1	Dept. of Biology Nankai University Tianjin	1976	gamma rays, 100 Gy [Shijiazhuang 63]	earliness shortness stiffness
Jinmai 34	Inst. of Crop Science Shanxi AAS Shanxi	1990	gamma rays, 250 Gy	drought tolerance yield
Jinmai 35	Wheat Institute Shanxi AAS Shanxi	1991	gamma rays, 200 Gy [K239 x 5084]	shortness drought tolerance earliness
Jinmai 22	Inst. of Cotton Shanxi AAS Shanxi	1982	cross M 70A2 x 68G 44-2	earliness drought tolerance yield
Jinmai 23	Inst. of Cotton Shanxi AAS Shanxi	1980	gamma rays, 300 Gy [(Fengchan 2 x Bima 4) x Nanda 2419]	earliness rust resistance adaptability
Kexing 15	Guizhou AAS Guizhou	1972	gamma rays [landrace]	rust resistance mildew resistance grain weight
Longfumai 1	IAAE Heilongjiang AAS Heilongjiang	1984	fN, $1x10^{11}$ [(Xinshuguang 1 x Liaochun 8)]	earliness protein content yield
Longfumai 2	Heilongjiang AAS Heilongjiang	1986	gamma rays, 180 Gy [(Nongxi 35 x Ke 250)]	earliness grain quality disease resistance
Longfumai 3	Heilongjiang AAS Heilongjiang	1987	gamma rays, 130 Gy [(Nongfu 77-4096 x S-A-25)]	earliness grain quality yield
Longfumai 4	Heilongjiang AAS Heilongjiang	1988	gamma rays, 110 Gy [(Heizia 266 x Ke 79F3-392)]	earliness disease resistance drought tolerance
Longfumai 5	Heilongjiang AAS Heilongjiang	1992	beta rays [Jiusan B 29-4]	earliness yield disease resistance

Longfumai 6	Heilongjiang AAS Heilongjiang	1994	gamma rays, 180 Gy [hybrid]	disease resistance yield
Longfumai 7	Heilongjiang AAS Heilongjiang	1996	gamma rays, 200 Gy [K202 (young spike)]	grain quality disease resistance yield
Longfumai 8	Heilongjiang AAS Heilongjiang	1998	gamma rays, 100 Gy [K202 (young spike)]	food processing quality disease resistance
Longfumai 9	Heilongjiang AAS Heilongjiang	1999	gamma rays, 180 Gy [Kejian 23]	grain quality disease resistance yield
Longfumai 10	Heilongjiang AAS Heilongjiang	2000	gamma rays, 110 Gy [K83183 (young embryo)]	food processing quality yield
Longfumai 11	Heilongjiang AAS Heilongjiang	2000	gamma rays, 110 Gy [LF8106 (young embryo)]	food processing quality yield
Lumai 11	Shandong Agric. Univ. Shandong	1988	cross Aimenniu x Fu 66	drought tolerance heat tolerance
Lumai 16	Jining RIAS Shandong	1990	laser [(Gao 8 x Yanda 72-629)]	lodging resistance yield
Lumai 20	IAAE Shandong AAS Shandong	1993	gamma rays, 25 Gy [321E (pollen)]	earliness disease resistance shortness
Lumai 4	Heze RIAS Shandong	1983	laser [70-4-92-1]	earliness yield adaptability
Lumai 5	Shandong Agr. Univ. Shandong	1984	cross Aimenniu x Fu 66	shortness disease resistance yield
Lumai 6	Dezhou RIAS Shandong	1984	laser [70-4-92-1]	earliness salt tolerance
Lumai 8	Shandong Agr. Univ. Shandong	1985	cross Aimenniu x Fu 66	yield grain size disease resistance
Luten 1	Shandong AAS Shandong	1968	gamma rays, 350 Gy [Huixianhong]	semi-dwarfness yield rust resistance

Nanjing 3	Jiangsu AAS Jiangsu	1976	gamma rays, 250 Gy [St 1472/506]	shortness stiffness yield
Nanyang 75-6	Nanyang RIAS Henan	1979	gamma rays + DES, 350 Gy + 0.37% [F_2 (St 2422/464 x Neixiang 5)]	uniformity rust resistance
Neimai 5	Neimenggu College of Agriculture Neimeng	1979	gamma rays [(Ourou x Liaochun 1) x Ruluo]	earliness Meromyza resistance rust resistance
Ningmai 3	Jiangsu AAS Jiangsu	1973	gamma rays, 250 Gy [St1472/506]	shortness disease resistance plant architecture
Qicheng 115	Stat. for Repr. Improved Varieties Shandong	1985	gamma rays, 25 Gy [F_1 (Qifu 04 x Yaan 74-550)]	stiffness spike size yield
Qichun 1	Qitai Agr. Exp. Inst. Xinjiang	1971	cross Xinguang 1 x Yuannong 1	drought tolerance grain weight grain quality
Qinchun 415	Qinhai AAS Qinhai	1993	gamma rays, 100 Gy [Abuo]	stress tolerance rust resistance
Qinghai 570	Qinghai AAS Qinhai	1996	gamma rays, 100 Gy [hybrid]	grain quality adaptability
Qinmai 6	Inst. of Food Crops Shanxi AAS Shanxi	1983	laser [F_1 (Zhengying 1 x Shanqian)]	stiffness disease resistance spike size
Qunzhong 42	Zhengjiang RIAS Jiansu	1968	gamma rays [Nannoundaheimang]	earliness spike size adaptability
Shannongfu 63	Shandong Agric. Univ. Shandong	1980	gamma rays, 300 Gy [F4 of (Youbao x Ourou)]	earliness plant architecture yield
Taifu 1	Shanxi AAS Shanxi	1966	gamma rays, 200 Gy [Nounda 183]	earliness rust resistance drought tolerance
Taifu 10	Shanxi AAS Shanxi	1968	gamma rays, 100 Gy [F_2 (Nongda 183 x Neixiang 5)]	drought tolerance rust resistance adaptability

Taifu 15	Shanxi AAS Shanxi	1968	gamma rays, 200 Gy [Nongda 183]	earliness rust resistance drought tolerance
Taifu 22	Shanxi AAS Shanxi	1968	gamma rays, 200 Gy [F_2 (Nongda 183 x Neixiang 5)]	tillering type drought tolerance
Taifu 23	Shanxi AAS Shanxi	1968	gamma rays, 200 Gy [F_2 (Nounda 183 x Neixiang 5)]	drought tolerance heat tolerance
Wanmai 32	Inst. of Crop Science Anhui AAS Anhui	1997	ion beams, 30 KeV [Yangmai 158]	plant type disease resistance yield
Wanyuan 28-88	Nanyang RIAS Henan	1979	gamma rays [F_2 (St2422/464 x Neixiang 5)]	shortness earliness
Wanyuan 75-6	Nanyang RIAS Henan	1979	gamma rays + DES, 350 Gy [F_2 (St2422/464 x Neixiang 5)]	earliness semi-dwarfness rust resistance
Wei 9133	Weifang RIAS Shandong	1993	fN [70-4-92-1]	lodging resistance disease resistance yield
Weifu 6757	Weifang RIAS Shandong	1986	gamma rays, 300 Gy [F_1 (Taishan 1 x Shanqianmai)]	rust resistance adaptability
Weimai 6	Weifang City AAS Shandong	2000	gamma rays, 300Gy [Hybrid]	earliness yield
Wuchun 3	Wumen IAS Neimengu	1973	cross (Pakistan x Kechun 5) x Yuannong 53 Yuannong 53	drought tolerance Meromyza resistance grain size
Xiaoyan 6	Nort-West Inst. of Botany CAS, Qinghai	1979	laser [St 2422/464 x Xiaoyan 96]	rust resistance Gibberella resistance grain quality
Xifu 3	Xichang RIAS Sichuan	1977	gamma rays, 300 Gy [NP 824]	disease resistance stress tolerance
Xifu 4	Xichang RIAS Sichuan	1980	cross 72 gamma-16 x Fanxiumai	drought tolerance adaptability yield
Xifu 5	Xichang RIAS Sichuan	1985	cross 72 gamma -16 x Fanxiumai	yield spike size grain number

Xifu 6	Xichang RIAS Sichuan	1989	fN, 3.9 x 10^{11} [Xifu 4]	earliness shortness yield
Xifu 7	Xichang RIAS Sichuan	1989	gamma rays chronic, 2.85 Gy [Xifu 4]	earliness mildew resistance grain quality
Xifu 8	Xichang RIAS` Sichuan	1991	gamma rays, 300 Gy [(Afunuoer x Fan 7)]	spike size lodging resistance adaptability
Xinchun 2	IAAE Xinjiang AAS Xinjiang	1984	gamma rays, 80 Gy [(Siete Cerros x Qichun 4)]	earliness grain quality
Xinchun 3	IAAE Xinjiang AAS Xinjiang	1986	gamma rays, 80 Gy [(Siete Cerros x Qichun 4)]	yield disease resistance lodging resistance
Xingchun 6	Inst. of Nuclear Biotechnology Xingjiang AAS Xinjiang	1993	cross 7906 x Xingchun 2	yield grain quality adaptability
Xingchun 7	Inst. of Nuclear Biotechnology Xingjiang AAS Xinjiang	1997	cross Zhong 7906 x Xingchun 2	yield
Xingdong 19	Inst. of Nuclear Biotechnology Xingjiang AAS Xinjiang	1995	gamma rays, 100 Gy [hybrid]	disease resistance cold tolerance drought tolerance
Xinongmai 2	South-West Agric. Univ. Zhongqing	1993	gamma rays, 200 Gy [77-2882]	earliness disease resistance yield
Xinshukuang 1	Heilongjiang AAS Heilongjiang	1971	gamma rays, 80 Gy [F3 (Abo M4 x Ourou)]	disease resistance stiffness humidity tolerance
Yanfuzao	Yancheng County Henan	1984	gamma rays + DES, 350 Gy + 0.37% [Yekaola]	earliness shortness
Yangmai 158	Lixiahe RIAS Jiangsu	1993	gamma rays, 250 Gy [hybrid]	yield disease resistance

Yannou 685	Yantai RIAS Shandong	1974	cross Youbao x Fuxi 4	rust resistance tillering type cold tolerance
YF188	Yantai City AAS Shandong	2000	gamma rays, 300Gy [Hybrid]	spike size yield
Yuanchun 7112	IAAE CAAS, Beijing	1975	cross Muoba 66 x Yuannong 60	yield semi-dwarfness rust resistance
Yuandong 2	IAAE CAAS, Beijing	1982	gamma rays, 250 Gy [12040 x Afunuoer]	earliness adaptability rust resistance
Yuandong 1	IAAE CAAS, Beijing	1979	gamma rays [Zaoyang x Dongfenhong 3]	earliness rust resistance adaptability
Yuandong 3	IAAE CAAS, Beijing	1989	gamma rays, 250 Gy [hybrid]	rust resistance mildew resistance heat tolerance
Yuandong 772	IAAE CAAS, Beijing	1977	gamma rays, 250 Gy [11141 x 12040]	yield winter hardiness tillering type
Yuandong 7848	IAAE CAAS, Beijing	1978	gamma rays, 250 Gy [12040 x Aurora]	yield disease resistance earliness
Yuandong 94	IAAE CAAS, Beijing	1984	gamma rays, 250 Gy [12040 x Ourou]	earliness grain quality rust resistance
Yuanfeng 1	IAAE Shandong AAS Shandong	1968	gamma rays, 350 Gy [Bima 4]	cold tolerance stiffness rust resistance
Yuanfeng 2	IAAE Shandong AAS Shandong	1969	gamma rays, 350 Gy [Bima 4]	cold tolerance stiffness rust resistance
Yuanfeng 3	IAAE Shandong AAS Shandong	1972	gamma rays, 200 Gy [Afu]	cold tolerance grain quality grain colour

Yuanfeng 4	IAAE Shandong AAS Shandong	1978	gamma rays, 300 Gy [Taishan 1]	shortness yield stiffness
Yuanfeng 5	IAAE Shandong AAS Shandong	1985	gamma rays, 250 Gy [(Nuofulin 13 x Youbao 57) x Xiayingsu]	earliness protein content rust resistance
Yuannong 53	IAAE CAAS, Beijing	1971	gamma rays, 150 Gy [F3 (Yuangnong 39 x Ourou)]	stiffness disease resistance
Yuannong 61	IAAE CAAS, Beijing	1971	gamma rays, 200 Gy [F3 (Yuangnong 39 x Ourou)]	yield rust resistance shortness
Yuanyuan 18-37	Nanyang RIAS Henan	1987	gamma rays + DES, 350 Gy + 0.37% [F_1 (St2422/464/Neixiang 5)]	yield adaptability
Yumai 12	Linxian County Henan	1988	gamma rays, 250 Gy [Bounong 7023]	earliness shortness grain colour
Yumai 4	Nuoyang RIAS Henan	1984	gamma rays, 200 Gy [Afu strain]	earliness disease resistance grain quality
Yumai 43	Inst. of Isotopes Henan AS Henan	1996	gamma rays, 300 Gy [hybrid]	disease resistance stress tolerance yield
Yunfu 2	Inst. of Cotton Shanxi AAS Shanxi	1982	cross M4-70-A2 x 68 G44-2	earliness drought tolerance yield
Yunfuzao		1980	gamma rays [(Fengchen 2 x Bima 4) x Nanda 2419]	earliness disease resistance
Yuyuan 1	Inst. of Isotopes Henan AS Henan	1979	gamma rays, 350 Gy [F_2 (St2422/464 x Neixiang 5)] heat tolerance	earliness drought tolerance
Zhangchun 10	Zhangye RIAS Gansu	1987	cross Gamma 3-3-2-2 x 3026	lodging resistance yield adaptability
Zhangchun 12	Zhangye RIAS Gansu	1990	gamma rays, 150 Gy [Gamma 47-3-1]	earliness plant architecture yield

Zhangchun 13	Zhangye RIAS Gansu	1991	cross Gamma 3-1-3 x 980-2	shortness earliness yield
Zhangchun 14	Zhangye RIAS Gansu	1991	cross 793-2-4 x Gaoyuan 338 x Gamma 47-12	earliness yield
Zhangchun 17	Zhangye RIAS Gansu	1998	gamma rays, 150 Gy [hybrid]	earliness shortness grain quality
Zhangchun 18	Zhangye RIAS Gansu	1998	gamma rays, 150 Gy [hybrid]	drought tolerance heat tolerance
Zhemai 3	IAAE Zhejiang AAS Zheijiang	1983	laser, 50 J [E-70]	earliness scab resistance yield
Zhemai 4	IAAE Zhejiang AAS Zheijiang	1989	laser, 50 J [(1-3-2 x 9-14-3-1)]	spike number lodging resistance
Zhemai 5	IAAE Zhejiang AAS Zheijiang	1991	gamma rays, 230 Gy [(Zheng 7495 x Anhui 11)]	earliness disease resistance stress tolerance
Zhengliufu	Henan AAS Henan	1976	gamma rays, 300 Gy [Zhengzhou 6]	drought tolerance rust resistance tillering type
Zhonga 1	IAAE Shandong AAS Shandong	1969	gamma rays, 200 Gy [Afu]	cold tolerance grain colour
Zhonghong 1	Guangdong AAS Guandong	1977	fN [Hongmang]	grain quality yield
Vigna angularis	asuki bean			
Jingnong 5	Beijing College of Agriculture Beijing	1999	gamma rays, 400Gy	earliness yield
Zea mays	maize			
Changdan 3 (H)	Changjizhou IAS Xinjiang	1985	Changfu 1-3 x Dahuang 46	earliness grain quality yield

Guidan 15 (H)	Inst. of Maize Guangxi AAS Guangxi	1991	Fuyingdi x Xi 103	earliness yield
Huafeng 100	IAAE Shandong AAS Shandong	1976	gamma rays, 340 Gy [(Hua 160xFengke 1)]	ear lower on stem grain weight combining ability
Jidan 1 (H)	Jilin AAS Jilin	1967	Ji 63 x Mo 14	blight resistance
Keduo 6 (H)	Chungzuoxian Seed Company Guangxi	1991	Fuxuan 24 x Ziduo	yield disease resistance adaptability
Liaoyangbei	IAAE Liaoning AAS Liaoning	1991	gamma rays, 280 Gy [population]	disease resistance stress tolerance yield
Liaoyuan 1 (H)	IAAE Liaoning AAS Liaoning	1988	Liaoju 311 x Liaobei 371	disease resistance stress tolerance yield
Longbaoyu 1 (H)	IAAE Heilongjiang AAS Heilongjiang	1990	Dong 96 x Ji 823	yield disease resistance
Longfuyu 1 (H)	IAAE Heilongjiang AAS Heilongjiang	1984	Dian 11 x Fu 746	yield protein content
Longfuyu 2 (H)	IAAE Heilongjiang AAS Heilongjiang	1987	F 564 x Fu 746	grain quality disease resistance
Longfuyu 3 (H)	IAAE Heilongjiang AAS Heilongjiang	1992	Fu 2691 x 8008	disease resistance stress tolerance
Ludan 50 (H)	Inst. of Maize Shandong AAS Shandong	1998	Luyuan 92 x Qi 319	yield disease resistance adaptability
Lude 5	Dezhou RIAS Shandong	1991	gamma rays, 200 Gy [hybrid]	stress tolerance
Luyu 3 (H)	Liaocheng RIAS Shandong	1980	Yuanwu 02 x Huangzao 4	disease resistance yield

Luyu 5 (H)	IAAE, Shandong AAS Shandong	1987	Yuanqi 123 x Huangzao 4	earliness yield adaptability
Luyu 12 (H)	IAAE, Shandong AAS Shandong	1993	Luyuan 133 x 8112	disease resistance yield adaptability
Luyuandan 1 (H)	IAAE, Shandong AAS Shandong	1976	Huafeng 100 x Va 35	disease resistance grain size grain quality
Luyuandan 3 (H)	IAAE, Shandong AAS Shandong	1976	Yuanwu 02 x Zifeng 154	disease resistance plant type
Luyuandan 4 (H)	IAAE, Shandong AAS Shandong	1976	Yuanwu 02 x Weifeng 322	earliness yield adaptability
Luyuandan 5 (H)	IAAE, Shandong AAS Shandong	1993	Yuanqi 123 x Huangzao 4	earliness
Luyuandan 7 (H)	IAAE, Shandong AAS Shandong	1981	Huanfeng 100 x Mo 17	cob size disease resistance
Luyuandan 9 (H)	IAAE, Shandong AAS Shandong	1987	Yuanqi 722 x Huangzao 4	earliness yield compact type
Luyuandan 14 (H)	IAAE, Shandong AAS Shandong	1997	Luyuan 92 x H 21	lodging resistance yield
Luyuandan 16 (H)	IAAE, Shandong AAS Shandong	1995	Luyuan 133 x 478	disease resistance grain quality
Luyuanshan 2 (H)	IAAE, Shandong AAS Shandong	1981	(Yuanwu 02 x Weifeng 322) x Huangzao 4	disease resistance yield adaptability
Mudan 7 (H)	Mudanjiang RIAS Heilongjiang AAS Heilongjiang	1983	Xin 212 x Mufu 1041	earliness disease resistance thermoinsensitive
Xiangsan 1 (H)	Zhangqiu County Shandong	1980	(Yuanwu 02 x Weifeng 322) x 330	disease resistance yield
Xinnongfuyu 1 (H)	IAAE Heilongjiang AAS Heilongjiang	1987	Kangdian 11 x Fu 746	vigour disease resistance

Xinongdanjiao 1 (H)	South-West Agric. Univ. Zhongging	1991	095 x 330	disease resistance yield grain quality
Xinyu 3 (H)	Inst. of Food Crops Xinjiang AAS Xinjiang	1986	Changfu 1-3 x 156A-4	grain quality yield stress tolerance
Yuan 74-751	IAAE CAAS, Beijing	1974	gamma rays + microwave, 250 Gy 8mm/min [Tangszupintou x Ye 2]	plant type disease resistance erect leaves
Yuan 79-171	IAAE CAAS, Beijing	1979	gamma rays, 30 Gy [Kung 70 (pollen)]	shortness earliness combinig ability
Yuan 79-418	IAAE CAAS, Beijing	1979	fN, $1.2x10^{11}$ [(A96 x Daqiu 36 x B 64)]	earliness disease resistance adaptability
Yuanlian 5 (H)	IAAE CAAS, Beijing	1980	Zi 330 x Yuanfu 01	earliness disease resistance adaptability
Yuanqi 123	IAAE Shandong AAS Shandong	1978	cross Yuanwu 02 x Qi 31	earliness disease resistance combining ability
Yuanqi 722	IAAE Shandong AAS Shandong	1978	cross Yuanwu 02 x Qi 31	earliness disease resistance combining ability
Yuanwu 02	IAAE Shandong AAS Shandong	1975	gamma rays, 300 Gy [Wudanzao]	earliness ear length/size combining ability
Zhongyuandan 32 (H)	IAAE CAAS, Beijing	1997	Qi 318 x Yuanfuhuang	quality yield lodging resistance
Zhongyuandan 4 (H)	IAAE CAAS, Beijing	1982	Yuanfu 17 x Huangzao 4	earliness disease resistance yield

Table 1. Number of officially released mutant cultivars in different species in China

Latin name	Common name	Number of mutant cultivars
Allium macrostemon	Chinese garlic	1
Arachis hypogaea	groundnut	29
Astragalus huangheensis	shadawang	5
Beta vulgaris	sugar beet	2
Boehmeria nivea	white ramie	1
Bougainvillea sp.	bougainvillea	2
Brassica napus	rapeseed	7
Brassica pekinensi.	Chinese cabbage	4
Camelia sinensis	tea	1
Canna indica	canna lilies	4
Chrysanthemum sp.	chrysanthemum	21
Citrullus lanatus.	watermelon	2
Citrus sp.	orange/mandarin	5
Colocasia esculenta	taro	1
Corchorus capsularis	jute	1
Coronilla varia	crown vetch	1
Cucumis sativus	cucumber	2
Dahlia sp.	dahlia	2
Glycine max	soybean	56
Gossypium sp.	cotton	8
Helianthus annuus	sunflower	1
Hordeum vulgare	barley	7
Ipomoea batatas	sweet potato	4
Linum usitatissimum	flax/linseed	3
Lycopersicon esculentum	tomato	2
Malus sp.	apple	1
Medicago sativa.	alfalfa	1
Morus alba.	mulberry	6
Nelumbo nucifera	lotus	3
Oryza sativa	rice	203
Phaseolus vulgaris	common bean	1
Pisum sativum	pea	1
Prunus persica	peach	2
Pyrus communis	pear	5
Raphanus sativus	radish	1
Rosa sp.	rose	35

Latin name	Common name	Number of mutant cultivars
Saccharum officinarum	sugarcane	2
Sesamum indicum	sesame	1
Setaria italica	foxtail millet	1
Setaria sp.	millet	20
Sorghum bicolor	sorghum	3
Triticum aestivum	wheat	129
Vigna angularis	adsuki bean	1
Zea mays	maize	39

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