WOGUO JIANLI SHIZHI XING PAISHENG
PINZHONG BAOHU ZHIDU TANJIU
——YI SHUIDAO WEI LI

我国建立实质性派生品种保护制度探究

——以水稻为例

陈　红◎著

中国农业出版社

我国建立实质性派生品种保护制度探究

——以水稻为例

陈　红　著

中国农业出版社

图书在版编目（CIP）数据

我国建立实质性派生品种保护制度探究：以水稻为例/陈红著．—北京：中国农业出版社，2012.11
ISBN 978-7-109-17335-4

Ⅰ.①我… Ⅱ.①陈… Ⅲ.①水稻—种质资源—保护—研究—中国 Ⅳ.①S511.024

中国版本图书馆CIP数据核字（2012）第261947号

中国农业出版社出版
（北京市朝阳区农展馆北路2号）
（邮政编码 100125）
责任编辑 宋会兵 吴丽婷

中国农业出版社印刷厂印刷 新华书店北京发行所发行
2012年11月第1版 2012年11月北京第1次印刷

开本：850mm×1168mm 1/32 印张：9.25
字数：215千字
定价：28.00元
（凡本版图书出现印刷、装订错误，请向出版社发行部调换）

摘 要

水稻是我国最重要的粮食作物，担负着确保国家粮食安全的重任。依靠科技进步提高水稻单产是人多地少的中国保障粮食安全的必然选择。提高水稻单产最有效的是加快良种培育、推广和应用。现代科学实践表明，每一次水稻育种的重大突破都与水稻优异种质的发掘和利用有着密切的联系。水稻育种创新是获得水稻优良品种的关键所在。在继20世纪50年代后期矮化育种和70年代中期杂种优势利用使我国水稻单产实现两次飞跃后，自80年代中期以来，我国水稻产量一直没有大的突破。

本研究通过对当前主要推广和申请保护的水稻品种相关数据进行分析，提出了我国水稻育种存在着遗传基础狭窄、种质资源利用水平不高、育成品种大多在低水平上重复、原始育种创新积极性不够、企业参与育种创新动力不足等问题。同时分析了植物新品种保护制度的缺陷，特别是缺乏限制实质性派生品种保护的制度是引起植物新品种审查、测试、侵权纠纷处理过程中难点问题的制度根源。由于育种过程简单，时间花费少，育种目标明确，利用目前的主要推广品种进行稍加改造就可以快速育成新的所谓自主知识产权品种。这种机制的直接后果使大量育种单位对投资育种研究缺乏动力，“谁搞原始育种，谁就是冤大头”。

近年来如何保护实质性派生品种已经成为全世界普遍关注的理论问题和各国植物新品种保护实践中面临的重要现实问题。实质性派生品种制度缺失已经引起了社会的强烈关注。本文在借鉴国际育种创新模式和发达国家先进管理经验的基础上，提出了加

强我国植物新品种保护制度创新，特别是建立实质性派生品种制度是当前激励水稻育种创新的核心任务。

本文还对我国申请保护的949份水稻常规种和杂交种进行SSR分析，从DNA水平上再次验证水稻育种遗传基础越来越狭窄、原始育种创新不足的事实，通过对其遗传多样性分析、指纹图谱构建，并结合品种选育系谱和田间DUS测试报告结果进行综合分析的基础上，最后从建立和完善实质性派生品种制度、改进新品种测试技术措施、建立实质性派生品种鉴定标准等方面提出了促进水稻育种发展形势创新的具体对策和措施。

具体结果如下：

1. 论证了我国水稻育种创新动力不足的制度根源

本书对我国科研教学、企业和个人自1999—2011年期间共申请公告的2 214个水稻品种，对2005—2009年期间我国主要推广水稻品种，对经农业部审批认定通过的71个超级稻品种的遗传系谱进行分析后认为：我国围绕核心种质资源进行短、平、快改造的水稻育种方式越来越明显，水稻原始育种创新动力严重不足。经分析后认为，这与我国植物新品种保护制度不完善有着紧密联系。当前加强植物新品种保护制度创新特别是建立实质性派生品种制度是激励我国水稻育种创新的核心任务。

2. 分析了我国主要水稻品种的遗传多样性

利用24对SSR引物对949份水稻材料进行PCR扩增，共扩增出清晰、重复性好、具有多态性的谱带211个。通过分别构建常规稻和杂交稻的系统发生树，可以明显地将籼稻和粳稻区分开来，揭示了常规稻和杂交稻的亲缘关系较远，基因型明显不同。通过DNA分析结果发现949份水稻品种的年度间GS整体呈上升趋势，说明供试品种间基因型差异越来越小。这从DNA水平上再次验证了目前我国水稻主要品种遗传基础比较狭窄，品种单一化问题严重，急需选育新品种类型，以此丰富品种的遗传变异。

3. 构建了我国主要水稻品种DNA指纹图谱

利用上述SSR多态性条带对供试材料进行了DNA指纹检测，构建了949个水稻品种×24个微卫星标记的DNA指纹图谱数据库。此项研究结果对今后开展水稻品种审定、种子质量鉴定、新品种保护和遗传资源评价等具有重要意义，同时也为植物新品种的科学审批、品种权科学执法等奠定基础。

4. 提出了促进水稻育种创新的政策和措施

在借鉴国际育种创新模式和发达国家先进管理经验的基础上，提出了促进水稻育种创新的对策：考虑到《条例》修改周期长，中短期而言，可以考虑对实质性派生品种授权采取5年的“隔离期”的行政措施、通过修订水稻DUS测试指南限制部分（不是全部）不具生产意义的性状改良以及调控“性状距离”来控制对特异性的判断等技术措施；长期而言，我国应当修订《条例》，建立实质性派生品种制度，甚至针对每类作物，建立适合我国国情要求的实质性派生品种鉴定标准，布局具有中国特色的“植物新品种保护版图”。

5. 探讨了水稻实质性派生品种的鉴定标准

对经DNA鉴定遗传相似度达到95%的共164对品种结合田间DUS测试结果和选育系谱分析后认为，根据目前我国水稻育种现状，在经过DUS测试明确判定申请品种具备特异性的前提下，可以将96%～98%作为鉴定实质性派生品种的阈值。在遗传相似度低于96%时，可以判定为不是实质性派生品种；当遗传相似系数高于98%时，可以判定为实质性派生品种；当遗传相似系数介于96%～98%时，需要进一步结合田间DUS测试结果和选育系谱等资料进行判定。该鉴定标准应该随我国水稻育种发展形势和DNA鉴定标准发展同步修订。

6. 提出了我国水稻育种策略合理化建议

在分析UPOV 1978年文本和UPOV 1991年文本区别基础上，结合我国水稻育种现状，提出我国应当建立短、中、长期相结合的水稻育种策略。从短期来看，我国应该积极主动引进国外

优良资源，通过物理辐射、化学诱变、回交、系统选育等短、平、快育种手段快速育成并尽早申请品种权保护。从中长期来看，我国应当在积极引进国外优良种质资源的同时，注重对资源的评价、鉴定与应用，特别应通过现代生物育种技术方式将其优良基因导入到本地优良品种中，培育一批具有重大应用前景和自主知识产权的突破性优良品种。同时提出，我国应该建立植物新品种权预警机制，特别在培育外向型品种时或者加入 UPOV 1991 年文本后，应密切关注出口对象国执行 UPOV 文本的情况，尽量避免在授权品种基础上直接采用转基因、系统选育、连续回交、诱变等育种方式，以免引起不必要的侵权纠纷。

目前国际上还没有发现其他研究者对水稻实质性派生品种保护制度及鉴定标准进行过系统研究，该项研究填补了国际空白，并将为我国实质性派生品种制度建立、《新品种保护条例》修订或上升为《新品种保护法》以及为我国加入 UPOV 1991 年文本作政策储备，为植物新品种权科学审批和执法等作出技术准备，同时也为其他作物实质性派生品种制度和鉴定标准研究奠定基础。

7. 提出了我国植物新品种权“走出去”的政策建议

我国要发展现代种业、建设种业强国，必须在激烈的国际种子市场竞争中掌握主动。支持植物新品种权走出国门已经成为我国政府在国际种业战略布局的重点，也成为我国种子企业开拓国际种业市场的必然选择。与发达国家积极在海外布局植物新品种权相比，我国植物新品种申请还基本局限在国内。在分析海外申请植物新品种权现状和影响因素的基础上，提出了我国应进一步完善植物新品种保护和种质资源管理制度、强化植物新品种保护战略性布局、构建植物新品种权预警系统、扶持一批外向型育繁推一体化企业、加强国际植物新品种保护中介服务等政策建议。

关键词：水稻；实质性派生品种；相似性；遗传多样性；指纹图谱；植物新品种保护；UPOV

Abstract

Rice is the most important food crops, shouldering the heavy responsibility of ensuring the country food safety in China. Relying on scientific and technological progress to increase rice yield is an inevitable choice for ensuring food safety in china. Accelerating thoroughbred breeding, promotion and application is the most effective measures to improve the yield of rice. Modern science and practice shows that every time the rice breeding breakthrough is closely linked with the exploitation and utilization of rice germplasm innovation. Breeding innovation is the key to obtain fine varieties of rice.

Since the dwarfing breeding in the late 50th century and heterosis utilization at the middle of the 70th century, rice yield in unit area has realized two leaps. But since the mid-1980s, there was no new breakthrough in rice yield in unit area.

This study based on the related data of main rice varieties in China, analyzed the following questions in the rice breeding: narrow genetic basis of the rice breeding, no high utilization level of germplasm resources, low repeated level of most varieties breeding, no enough original breeding enthusiasm for breeding innovation, shortage of innovation power of enterprises to participate in the rice breeding. It also analyzed the defects of the system of new plant varieties protection (PVP) is having a bad im-

pact on the examination, DUS testing and handling of tort disputes. Due to the simple and easy breeding process, taking less time and the clear breeding goal, the slight transformation of the main current varieties can quickly breed the new so-called independent intellectual property varieties. The direct consequence of this mechanism makes the large number of breeding units lack of motivation for investment in breeding research.

How to protect Essential Derived Varieties (EDV) has become one of the concerned universal theoretical problems and important practical problems in the practice of new plant varieties protection of all countries these years. The lack of EDV system has already caused the intense attention of the society. On the basis of the international breeding innovative models and the advanced management experience of the developed country, we have given some suggestions to strengthen our protecting system of innovation of new plant varieties. Establishment of EDV system is the innovative core tasks to encourage the rice breeding innovation.

The study also analyzed the 949 copies of conventional varieties and hybrids of rice which applied for plant varieties protection. From the DNA level we have once again proven that the genetic base of rice breeding is increasingly narrow, and the varieties are very lack of the original breeding innovation. Through analysis of their genetic diversity and fingerprinting mapping, combination with data of pedigree breeding and field results of DUS test reports on the basis of comprehensive analysis, we finally gave some countermeasures and measures such as the establishment and improvement of PVP system, improving testing technical measures of new plant varieties, establishment of the

identification standards of EDV for the promotion of innovation in rice breeding.

The results are as follows:

1. Demonstrated the system problems of sufficient power in rice breeding innovation

The study analyzed the genetic pedigree of rice varieties including 2214 rice varieties which are applied by the scientific research and teaching, enterprises and individuals from 1999 to 2011, main rice varieties in promotion from 2005 to 2009 and 71 super rice varieties approved by Ministry of Agriculture. In the author' s opinion, the result showed that the basic transformation of rice breeding around the core germplasm in our country has become more and more obvious, and the original rice breeding is more and more shortage of innovation power. And it is closely linked with the unperfected PVP system in our country. Strengthening the system innovation of PVP is one of the core tasks to motivate rice breeding innovation in China.

2. Analyzed the genetic diversity of main rice varieties

24 selected SSR primers were used in PCR amplification of 949 tested rice cultivars to identify genetic relationship. The results showed that 211 bands with distinct, good repeat ability and polymorphic were amplified. Through constructing the neighbor-joining tree of 409 accessions of inbred rice and 540 accessions of hybrid rice based on Nei's genetic distance using data for 24 SSR loci, it is very easy to distinguish indica cultivars and japonica cultivars. The results also showed that conventional rice varieties and hybrid rice varieties had a distant relationship and the genotype was significantly different, there was great difference between the genotype genetic. Through the DNA analysis

results of the annual *GS* ascendant trend, it showed that the genotype difference between the cultivars became more and more small. From the DNA level we have once again proven that the genetic base of rice breeding was increasingly narrow, the problems of varieties simplification became more and more serious. It is in urgent need of the breeding new type of varieties to enrich genetic variation.

3. Constructed the DNA fingerprint map for main rice varieties in our country

A DNA fingerprint database containing genotypic data of 949 rice variety times 24 marker loci, was constructed. DNA fingerprinting is a useful tool for the registration and identification of new cultivars, the plant varieties protection and evaluation of genetic diversity. The results also laid on the foundation for the scientific approval of new plant varieties and the scientific law enforcement of variety rights.

4. Put forward the suggestions to promote rice breeding innovation

On the basis of the international breeding innovative models and the advanced management experience of the developed countries, we put forward to promote the countermeasure of innovation in rice breeding. Considering the long cycle of modifying the regulations is very long, in the short-to medium run, EDV could be taken the administrative measures to be protected for 5 years. Through the revision of rice DUS testing guideline, no-productive characteristics are limited. And the technical measures were taken to adjust the characteristics distance to control the specificity judgments. In the long term, our country should revise PVP regulations and establish the EDV system. Even for each type of

crops, we should establish the EDV identification standards suitable for China's national conditions, and layout with plant variety protection territory of Chinese characteristics.

5. Discussed the rice EDV identification standards

According to our current situations of rice breeding and the DNA identification results of genetic similarity reaches 95% of the total 164 copies of species with DUS test results and pedigree analysis, the 96% - 98% can be used as EDV identification threshold. When the genetic similarity is lower than 96%, it cannot be judged as EDV; when genetic similarity coefficient is higher than the 98%, it can be judged to be EDV; when genetic similarity coefficient is between 96% and 98%, DUS needs to be further combined with field test result. The appraisal standards should be revised with the development of rice breeding and DNA appraisal standards synchronously.

6. Put forward rational suggestions on the rice breeding strategy in China

On the basis of analyzing the difference between UPOV 1978 Act and UPOV 1991 Act, combining with the current situations in rice breeding, the author put forward the rice breeding strategy combined with long-term and short-term. In the short term, China should actively introduce the foreign genetics resource, breed new varieties and apply for plant varieties right and obtain a complete independent intellectual property rights as soon as possible through some short-smooth-fast breeding methods including physical radiation, chemical mutation, backcross, system breeding and so on. In the medium-long term, when we introduce the foreign varieties, we should pay great attention to the resource assessment and identification and application, the

foreign germplasm resources should also be hybridized with the local fine varieties at the same time to obtain a great deal of fine varieties which are suitable for popularization in our country. At last, our country should establish the early warning mechanismin in PVP, and try to avoid the breeding methods such as transgenic, system selection, continuous backcross, mutagenic breeding way directly based on protected varieties in order to avoid infringement disputes especially when cultivating export-oriented varieties or after joining UPOV 1991 Act.

It is found that no other researchers have studied the rice EDV system and identification standard systematically. This study will fill the international gaps. And it will prepare for our country to establish the EDV system, revise PVP regulations, join in the UPOV 1991 Act, and also lay the preparation for the establishment of other crops' EDV system and identification standard.

7. Put forward policy recommendations on the applications of new plant varieties rights to the overseas

China must seize the initiative in the international seed market to develop and build modern and powerful seed industry. Supporting new plant varieties rights to apply in the overseas has become the focus of our government in the strategic layout of the international seed industry, but also become the inevitable choice of seed enterprises to open up the international seed market. Compared to the developed countries actively applying more new plant varieties rights in the overseas, China just applied a little of new plant varieties rights and most applications were limited in the domestic. On the basis of the analysis of the current situation and impact of new plants varieties of overseas ap-

plicants, the author provides some policy recommendations such as China should further improve the system of new plant varieties protection and germplasm resources management, strengthen the strategic layout of the new plant varieties protection, construct new plant varieties rights warning system, support a number of export—oriented enterprises, strengthen the international intermediary services of the new plant varieties protection.

Key word: Rice; EDV; Genetic similarity; Genetic diversity; Fingerprint; New plant varieties protection; UPOV

序

水稻是我国最重要的粮食作物，担负着确保粮食安全的重任。依靠科技进步提高水稻单产是人多地少的中国保障粮食安全的必然选择。提高水稻单产最经济有效的手段是加快良种培育、推广和应用。现代科学实践表明，每一次水稻育种的重大突破都与水稻优异种质的发掘和利用有着密切的联系。育种创新是获得水稻优良品种的关键所在。

目前，研究者对于影响作物育种创新的研究大多局限在种质资源发掘、育种技术创新和加大资金投入层面，少有人从建立完善相关管理制度和技术标准等角度进行剖析。实际上在影响育种创新的三大因素中，制度建设相比于科技创新和资金投入影响更为深远，切实激励育种创新的效果更为明显。

近年来如何保护实质性派生品种已经成为全世界普遍关注的理论问题，也是各国植物新品种保护实践中面临的重要现实问题。实质性派生品种制度缺失已经引起了社会的强烈关注。本书作者以水稻为例提出的我国建

立实质性派生品种制度的理论研究，源于对我国农业植物新品种保护的历史、现状和未来的深度思考。这对有效开展农作物品种资源鉴定、评价、保存和有效利用，促进农作物原始育种创新，科学开展植物品种权审查、植物品种权纠纷调处等工作；为我国实质性派生品种制度建立，《植物新品种保护条例》修订或《植物新品种保护法》制订以及为我国加入国际植物新品种保护联盟（UPOV）1991年文本做政策储备和技术准备；同时可为其他作物实质性派生品种制度研究奠定基础。

本书对完善植物新品种保护制度，构建国家农业科技创新体系，推进现代种业发展，具有重要参考价植。

中国工程院院士 袁隆平

二〇二一年十月

前 言

植物新品种是指经过人工培育或者对发现的野生植物加以开发，具备新颖性、特异性、一致性和稳定性并有适当命名的植物品种[1]。植物新品种保护制度是农业知识产权保护制度最重要的组成部分，是推动农业作物育种创新、提高农产品国际竞争力、确保农业主权和植物遗传资源安全的重要制度保障[2]。国际植物新品种保护联盟（UPOV）公约通过协调各成员国之间在植物新品种保护方面的法律和政策来保障育种者权益[3]。UPOV公约最先形成于1961年，并于1972年、1978年和1991年在日内瓦进行了3次修订，分别为1961/1972文本、1978年文本、1991年文本。目前UPOV有70个成员，其中有50个成员实施UPOV 1991年文本。UPOV 1991年文本引入了适当限制实质性派生品种保护的制度，这对激励和保护作物原始育种创新具有重要的意义。

我国对于水稻育种特别是水稻杂种优势利用的研究在国际上处于领先地位，但是近年来所谓水稻“克隆育种”、“模仿育种”、“贼选品种”等品种数量增长很快，