

四川 SICHUAN 森林病害 SENLIN BINGHAI



陈守常 朱天辉 杨佐忠 编著

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谨以此书

纪念四川森林病害研究
与治理 50 周年

This monograph is for Commemoration the
50th Anniversary of Research and Control of For-
est Diseases in Sichuan Province

内容提要

全书分为五部分。第一篇,森林病理学理论与实践。论述森林病理学原理、病害类别、流行和综合控制。第二篇,四川森林病害研究与控制。记述森林病害研究内容、种类、规律和控制途径。第三篇,四川重要森林病害。详述 25 种森林病害发生发展以及综合控制。第四篇,四川主要森林病害。简述 61 种森林病害症状、病原和控制方法。附录部分,包括四川林木、病原名录。记录主要林木——病害名录(558 种),病原——树种名录(498 种)。本书 100 万字,表 188 个,图 43 幅,黑白病原图 93 幅和症状彩照 143 幅。

本书系 50 年四川森林病害研究成果与控制经验的基本总结,可供林业院校、科研、管理单位和基层森林保护工作者参考。

Summary

The monograph consists of five parts, Part 1. Theory and Practice of Forest Pathology, discusses the concept, categories, prevalence and integrated control of forest diseases, Part 2. Study and Control of Forest Diseases in Sichuan, describes the contents, categories, rules and ways of control, Part 3. Important Forest Diseases in Sichuan, presents the occurrence rules and control of 25 kinds of important and serious forest diseases in detail, Part 4. Main Forest Diseases in Sichuan, including symptom, pathogeny and control method of 61 species of forest diseases, Appendix, The List of Forest trees and Diseases in Sichuan, records the name of forest diseases and pathogeny tree species (558 items). The monograph contains one million Chinese characters, 188 tables, 93 black and white pictures for pathogene and 143 colorful symptom photographs.

The monograph gives a basic summary for the past 50 years of study on forest diseases, especially research achievements and work experience in forest diseases. It could be a reference to forestry colleges, scientific research and management units as well as workers in forest protection.

作者简介



陈守常 男(1930~),福建福州人。1954年北京农业大学毕业。四川省林业科学研究院教授级高级工程师、研究员。

在50年森林病害研究中,主持冷杉、云杉、油桐等16个树种病害的考察和研究,先后获四川省科技进步一等奖1项、二等奖1项、三等奖3项以及四川省科学大会奖等10项。编著出版《陈守常文集》等5部著作,参与5部专著编著。在一级学报及国际会议上发表论文18篇,发表论(译)文150余篇,科普作品68篇。

发现油茶炭疽病有性阶段,鉴定病原菌2个新种和1个新专化型,研究3种新病害发生规律,探索2种森林病害流行概念,认定森林病害是不冒烟的“森林火灾”,倡导以营林技术措施为主的综合防治,提出森林生态性病害是第三类森林病害,并采取营林生态治理,控制森林病害。

1986年被列入国际林联出版的《世界森林病理学家和昆虫学家辞典》。同年,参加林业部组团赴美考察,1988、1989年分别出席在日本召开的国际植物病理学会议和森林保护学术会议。1991年参加国际林联山地森林保护和管理学术会议。1990年被评为首届四川省林业拔尖人材,1994年入选《巴蜀英谱》。1992年享受国务院政府特殊津贴。



朱天辉 男(1963~),重庆市开县人。1984年四川农业大学毕业,博士、林园学院教授、博导。从事森林病害教学和研究20余年,主持花椒根腐病、叶锈病、膏药病、枯斑拟盘多毛孢菌毒素、黄柏锈病、板栗疫病、生物防治基因工程构建等项研究工作。发表论文30篇,合作论文10篇,主编著作3部。培养硕士10位。获四川省科技进步奖3项,地区科技进步奖1项。2000年参加第一届亚洲森林病理学会议。2005年被评为第四届四川省林业拔尖人才。



杨佐忠 男(1964~),四川苍溪人。1984年西南林学院毕业,南京林业大学博士。四川省森林病虫害防治检疫总站教授级高级工程师。从事林业有害生物管理和研究20余年,主持华山松疱锈病、马尾松疱锈病、枯草芽孢杆菌PRS₅、榕树烂皮病等项研究工作。发表论文25篇,参编专著10部。获四川省科技进步二等奖1项、三等奖1项。2002年参加第二届国际林联锈菌学术会议,2004年参加林业部组团赴日考察松材线虫病。2005年被评为四川省有突出贡献的优秀专家。2006年参加亚太地区林业入侵物种早期预警体系学术会议。

A Brief Introduction of the Authors

CHEN Shouchang, male (1930 ~), was born in Fuzhou, Fujian province, and graduated from Beijing Agricultural University in 1954. He is a Senior engineer of professor, researcher in Sichuan Academy of Forestry.

During 50 years research on forest diseases, he has presided over the investigation and study of diseases on 16 kinds of trees, such as fir, spruce, tung – oil tree, and so on. He obtained ten awards, including 1 first – class award, 1 second – class award, 3 third – class awards for Sichuan Scientific & Technological Achievement and Province Science Meeting Prize. In 1986, he was listed in the Thesaurus of the world well – known Forest Pathologists and Entomologists published by IUFRO. He has compiled five monographs, such as “Chen Shouchang Collected Works”, and so on, cooperatively published five monographs. He also published 18 articles on first – class journals & national conferences, and about 150 articles and translations on other publications. He joined in the team to review to USA in 1986, and attended the conference on International Plant Pathology & Forest Protection in Japan respectively in 1988 & 1989, IUFRO Workshop in Chengdu in 1991. In 1992, he became the recipient of the special allowance from the state government.

ZHU Tianhui, male (1963 ~), professor, and instructor for doctor, was born in Kai county of Chongqing Municipality, and graduated from Sichuan Agricultural University in 1984, in which he was conferred his Master and Doctor's degree. During his research and teaching on forest diseases the past 20 years, he presided over study on several research projects, such as pricklyash root-rot, pricklyash leaf rust, pricklyash plaster, toxin of *Pestalotiopsis funera*, Amu cork leaf rust, chestnut blight, gene engineering microbe construction for bio-control and so on. He has published 30 articles, cooperatively published 10 articles, compiled three monographs. Besides, he has acquired 2 awards for Sichuan Scientific & Technological Achievement and attended the first conference of Forest Pathology in Asia, in 2000.

YANG Zuoxiong, male (1964 ~), Senior engineer of professor, was born in Changxi in Sichuan province, graduated from Southwest Forestry College in 1984, was conferred got his Master degree in Sichuan Agricultural University and Doctor degree in Nanjing Forestry University. During more than 20 years of study and management on forest pests, he presided over study on pine blister rust, pine stem rust, making use of *Bacillus subtilis* (PRS5) for control pine damping-off, ficus back-root. He has published 25 articles, cooperatively published 10 monographs. Besides, he has acquired second- & third-class awards for Sichuan Scientific & Technological Achievement. Moreover, he attended the review to Japan for pine wood nematode in 2004, and attended “Early warning system for forest invasive species” hold by FAO in 2006.

序

四川位于我国西南部,地处青藏高原和长江中上游之间的过渡地带,幅员辽阔,东西两部分自然地理相差悬殊,东部为群山环抱的四川盆地(海拔200m),西部为宏伟奇特的高山山原(海拔3 000~7 500m);地貌复杂,由平原、丘陵、山地至高原;气候多样,有亚热带、暖温带、温带、寒温带和亚寒带五个气候带;树种繁多,29科500属4 000余种,其中乔木1 000多种,因而出现森林有害生物多样性,发生多种严重森林病害,并成为林业建设的重要限制因素。

近年,四川大力实施天然林保护工程和退耕还林工程,积极构建长江生态绿色屏障,森林覆盖率已上升至28.98%。但由于森林分布边远山区,而且树木高大,给森林病害研究和治理增加一定难度,对森林的可持续经营和林业可持续发展造成巨大损失。

陈守常先生是新中国成立以来第一代的知名森林病理学家。

他深入实际,勇于开拓,对原始林区多种腐朽病调查研究,经济林区严重病害列项研究,用材林区、竹林区重要病害课题研究,取得丰硕成果,从而促进林业生产发展。

他善于学习,不断创新,在系统研究各种森林病害流行和成灾规律后,提出了森林病理学第三类别的森林生态性病害。对冷杉病朽病发生发展三大规律等论断,有着独特创见。

在50年的森林病害研究工作中,陈先生在实践上付出辛勤劳动,对中国森林病理学理论作出积极贡献。他论著甚丰,学术水平较高,从他著的《陈守常文集》中略见一斑。他勤奋好学,苦耐劳,老而不倦,在身体欠佳情况下,仍奋力拼搏。我为他的成就而感到高兴。

现在又读到这一著作,这是他和年青学者努力的科学成果,具有四川特色,既有理论创新,又有应用基础,是四川森林病害多年的研究和治理的森林病理科学专著。这部专著从森林生态系统出发,在森林病害可持续控制的层面和森林病理学科发展的前沿上,提出四川森林重要病害的控制对策,并在更高的战略思维下提出未来控灾策略。

我认为,《四川森林病害》不失为一部高水平的森林保护专著。它的出版,必将对四川林业建设起着积极推动作用,而且将对我国和四川森林病理事业产生重大而深远的影响。

欣慰之余,命笔作序。

中国工程院资深院士
著名植物病理学家
中国农业大学教授



2006.3.20

前 言

森林病理学,创立于19世纪80年代(1882),是现代林业的一门独立学科,是研究森林生态系统内森林植物病害现象与综合治理(可持续控制)的理论与技术。

当今,森林病理学领域正向宏观和微观两个方向发展,在宏观指导下的微观研究,同时,将微观进展进行宏观分析。分子生物学和森林生态学的迅速发展,对森林病理学的各个领域产生前所未有的影响,并不断改变和扩展森林病害研究范畴和概念。

森林病害是自然界非常普遍的一种灾害现象,更是林业生产上主要限制因子的一类生物性灾害。对森林、园林、林副产品等的危害性较之森林火灾和森林虫害有过之而无不及。无数事实已被国内外历史和现实所证实。

但由于森林病害具有发生的隐蔽性、复杂性和防治的艰巨性等特点,致使林木生长受到抑制,林产品减产、变质,甚至大片森林死亡。加之,许多常发性森林病害连续发生,检疫性病害日益扩展,对四川林业建设和森林生态环境造成严重破坏。

近年来,随着四川天然林保护工程和退耕还林工程的持续推进,生态公益林、商品用材林的不断营建,森林病害问题更加突出,诸如松材线虫病、林木冠瘿病等检疫性病害的相继入侵和发生,普遍引起社会和林业部门的重视,要求改变被动局面,大力开展科研,加强检疫,控制灾害。为了适应四川林业生产发展的需要,作者在多年从事森林病害研究和控制工作的基础上撰著此书,以期发展林业科技事业,推动森林病理科技进步,提高生产人员素质,并企盼在促进四川林业可持续发展和森林病害可持续控制,稳定和保持森林生态平衡中起到应有作用。

全书分为四篇。第一篇,森林病理学理论与实践。论述森林病害概念、类别分类、侵染、流行理论和综合控制。第二篇,四川森林病害研究与控制。记述四川森林病害简史、种类、分布、损失和治理,总结50年的研究和控制概况。第三篇,四川重要森林病害。详述四川省检疫、真菌、细菌、植原体、生态(生理)病害和寄生害等25种重要而严重发生的森林病害流行规律和综合控制,而这些病害的研究大部分先后获得四川省政府科技成果奖或科技进步奖。第四篇,四川主要森林病害。简述包括61种主要森林病害症状、病原及控制方法。按针叶林、阔叶林、经济林的种(实)苗、叶部、枝干、根部和生态(生理)各类森林病害顺序编撰。附录,四川林木与病害(病原)名录。记录四川主要林木——病害名录(558种)和主要林木病原——树种名录(498种)。书后附有各种森林病害症状彩图。

本书在陈守常编著的《林木病害论》(1997年内部交流书稿)的基础上撰写和修改了第一篇、第二篇、第三篇中的松材线虫病、华山松疱锈病、猕猴桃溃疡病、油橄榄孔雀斑病、林木冠瘿病、苗木猝倒病、云杉球果锈病、柠檬黑星病、松赤枯病、杉木炭疽病、马尾松疱锈病、竹秆锈病、竹丛枝病、油桐根腐病、泡桐丛枝病、华山松落叶枯死、楠竹枯枝(死)、杉木黄化病、冷杉腐朽病、油杉矮槲寄生和第四篇中的51种病害、第五篇附录四川林木、病害、



病原名录等内容。四川农业大学林园学院朱天辉教授撰写第三篇中的花椒根腐病、板栗疫病、黄柏锈病,第四篇中的花椒叶锈病、膏药病;同时,邀请四川农业大学农学院黄云教授撰写第四篇中的7种锈病,即圆柏锈病(梨、苹锈病)、白蜡树锈病、五味子锈病、接骨木锈病、牛奶子锈病、长叶胡颓子锈病和小舌紫苑锈病;四川农业大学都江堰分校杨礼传副教授撰写第三篇中的云杉落针病、枣疯病;四川省农业厅植物检疫站江式富高级农艺师撰写第四篇中的柑橘溃疡病;四川省林业科学研究院肖育贵高级工程师提供柠檬黑星病论文。上述文稿由作者修改和补充,最后将全书汇总,并绘制图表。

在编撰过程中,承蒙著名植物病理学家、中国农业大学教授、中国工程院院士曾士迈教授,北京林业大学沈瑞祥教授、杨旺教授,南京林业大学叶建仁教授,安徽农业大学刘世骥教授、林英任教授,河南农业大学任国兰教授,陕西省林业科学研究院宋晓斌研究员,西南林学院陈秀虹教授,贵州省林业科学研究院胡炳福研究员等知名森林病理学学者的大力支持,有关林业院校、科研单位的同行们提供了宝贵资料、症状彩照和病原图。四川科研、教学和管理部门以及基层森林病虫害防治科技工作者更是提供了大量科技成果及彩照,因而使本书编著得以完成。

值得指出的,本专著的出版得到了中国科学院、水利部、成都山地灾害与环境研究所研究员、程根伟所长(国家科技攻关项目:三江流域生态功能区建设的关键技术与示范,2002BA901A42),四川农业大学林园学院教授、胡庭兴院长,四川省凉山彝族自治州森林病虫害防治站高级工程师、赵谦站长的有力资助,四川省林学会高级工程师、杨灌英秘书长,四川省森林病虫害防治检疫总站的大力支持,对此,特致以深深的谢意。

50年来,四川各级管理、科研、教学和生产单位长期投入了资金、技术和人力资源,森林病理科技队伍不断壮大,先后完成了原始森林病害调查35项、专题考察6项;人工林森林病害调查16项、专题考察36项;森林病害研究项目52个,从而获得了丰富的科技资料。四川科技成果34项,发表论文411篇,出版书籍7部,参与国内专著撰写并出版11部,编辑发行《林业病虫害防治》20期(至1996),《四川林业科技》森林病虫害防治专辑出版9期。所有的成就,为四川森林病害事业发展奠定了可靠的基础。因此,本书是四川广大森林病理科技工作者劳动的结晶,也是四川森林病害科技成果50年的总结。但愿本书能为中国森林病理学发展作出微薄的贡献。

作为科学工作者,本书主要编著者年事虽高,但编撰专业著作仍是对社会的历史责任。限于作者水平有限,加之又患“二重癌”疾,正在康复治疗中,因此,本书难免存在错误或不足之处,尚望读者批评指正。如果本书对读者有所裨益,对四川林业建设有所作用,那将是我们最大的欣慰。

最后,我们谨以此书,作为四川森林病害研究和治理50周年的纪念。

祝愿四川和我国森林病理事业有长足进展,以优异成绩迎接更加辉煌的明天。

2005年12月



Preface

Forest Pathology, initiated in 1882 as an independent discipline in modern forestry, studies the theory, technology and integrated control (sustainable control) of forest diseases in forest ecosystems.

The forest disease is a universal disaster phenomenon in nature and one of the most dangerous biohazards in forestry production. Its damages to the forests, gardens, and the forest by-products, which have been proved by the history and reality both at home and abroad, are no less than the damages caused by forest fires and forest pests.

Because of its characteristics, such as occurrence being cryptic, stubborn and control complicated, the forest disease is difficult to recognize and control forest diseases, which leads to the restraint of the forest growth, the reduction and deterioration of forest products, even to the death of vast forest stands.

In recent years, the severity of the problems has aroused the society and forestry department for greater attention to changing the passive situation, conducting scientific research, strengthening the quarantine and controlling the diseases. For meeting the demands of the forestry development in Sichuan province, the authors compiled this monograph based on the research and practical control of the forest diseases for all the years, aiming to develop the forestry science and technology, impel the progress of the forest pathology and improve the personnel's capability. We also hope that it can exert a function in promoting the sustainable development of Sichuan forestry, and keeping control on the forest diseases, stabilizing and balance of the forest ecosystem.

The monograph consists of four parts. Theory and Practice of Forest Pathology (Part 1) focuses on the concepts of category, classification, infection, theory of prevalence and integrated control of forest diseases. Study and Control on Forest Diseases in Sichuan (Part 2) describes history, sort, distribution, loss and control, and summarizes the research and control works in the past 50 years. Important Forest Diseases in Sichuan (Part 3) presents the occurrence and control of 25 kinds of important and serious forest diseases in detail, including quarantine, fungi, bacteria, phytoplasma, ecological (physiological) and parasitic diseases and so on. Most of these studies have successively won awards for Sichuan Scientific and Technological Achievement. Main Forest Diseases in Sichuan (Part 4), including symptoms, pathogens and control methods of 61 sorts of forest diseases, is written in sequence of the seed, leaf, branch, root and ecological



(physiological), categories of coniferous forests, broad-leaved forests and economic trees. The List of Forest Trees and Diseases in Sichuan (Part 5, Appendix) records the name of 558 items of forest diseases and 498 items of pathogen-tree species in Sichuan. Various colorful pictures of diseases symptoms are appended in the end.

This monograph based on "Theory of Forest Diseases" compiled by CHEN Shouchang in 1997. Professor ZHU Tianhui (Forestry and Horticultural College of Sichuan Agricultural University) composed on pricklyash root-rot, chestnut blight, amur cork leaf rust, pricklyash leaf rust, pricklyash plaster. Meanwhile, Professor HUANG Yun (Agricultural College), wrote sabine rust, Chinese ash rust, orange magnoliavine rust, williams elder rust, autumn olive rust, bock elaeagnus rust and small-ligulate aster rust. Vice Professor YANG Libang (Dujiangyan Branch Department of Sichuan Agricultural University) wrote spruce needle cast and jujube witches' broom, and citri canker was written by Senior agronomist JIANG Shifu (Quarantine Station of Sichuan Agricultural Office), Senior engineer XIAO Yugui (Sichuan Academy of Forestry) offered the articles about lemon black spot. The monograph was compiled and modified by CHEN Shouchang at last.

I would like to express our deep thanks to Professor ZENG Shima, an Engineering academician of the Chinese Academy of Engineering, Professors SHEN Ruixiang and YANG Wang from Beijing Forestry University, Professor XIE Jianren from Nanjing Forestry University, Professors LIU Shiqi and LIN Yingren from Anhui Agricultural University, Professor REN Guolan (Henan Agricultural University), Researcher SONG Xiaobin (Shanxi Academy of Forestry), Professor Chen Xiuhong (Southwest Forestry College), Researcher HU Bingfu (Guizhou Academy of Forestry), and other forestry colleges, research departments concerned, who offered valuable materials and colorful pictures. We also would like to give special thanks to the research, teaching and administrating sections in Sichuan province and the people working at the grassroots level of forest disease control technological departments for their help.

Professor CHEN Genenwei, Director Institute of Mountain Disasters and Environment, Chinese Academy of Sciences, Professor HU Tingxing, Dean the College of Horticulture of Sichuan Agricultural University, Senior engineer ZAO Qian, Head the Station of Forest plant Pest Control, Forestry Bureau of Liangshan Yi nationality autonomous prefecture of Sichuan Province financed, Senior engineer YANG Guanying, Chief Secretary Sichuan Forestry Society, The General Station of Forest Plant Quarantine and Pest Control of Sichuan Province supported the publication of the monograph. Here, we give our sincere gratitude to them.

In the past 50 years, many technological and practical worker of forest pathology were engaged in arduous works on the research and control, and carried out 35 investigations, 6 special review on primitive forest diseases, 16 investigations and 36 special reviews on the artificial forest diseases, and 52 research projects on forest diseases. Moreover, 34 awards for scientific and technological achievements were gained, 411 articles were published. All of these achievements

have established a reliable foundation for the development of forest diseases control in Sichuan Province. Therefore, this monograph is also the summary of the achievements in the studies of forest diseases control in the past 50 years. I hope it could add a small part to the development of the forest pathology in China.

Finally, this monograph is to commemorate the 50th anniversary of the research and control on forest diseases in Sichuan Province.

The authors sincerely welcome comments and criticisms from our colleagues and readers. If it could contribute a little to the readers and the forestry development, we will be gratified.



December, 2005

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