

# Patented agrochemicals invented by Chinese researchers

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China has become one of the key countries for agrochemical discovery. Dozens of lead compounds are discovered from some 10,000 synthesised compounds annually in China, of which, roughly 20 compounds are placed into initial field trials. New active ingredients invented in China, such as flumorph and cyclozaprid, have been globally recognised by professionals. Since 1995, close to 90 ais have been patented in China.

**Fungicides:** Chinese inventors have applied for 23 patents under the Patent Cooperation Treaty (PCT) patents. Among them, one is an anti-virus molecule, based on a ferulic acid derivative. The rest are fungicidal molecules. Methoxyacrylate strobilurins rank first, accounting for half of the ais. They are followed by pyrazoles and acrylamides with two patents each. To date, six patented ais have been commercialised, namely, flumorph, pyraoxystrobin, pyrametostrobin, coumoxystrobin, tricyclopyricarb and pyrimorph. Five of them were invented by the Shengyang Research Institute of Chemical Industry (SYRICI). It is widely recognised that there are numerous new molecules in the pipeline.

**Insecticides:** Chinese researchers have so far applied for 42 PCT patents. These were led by neonicotinoids, followed by diamides, pyrethroid esters and pyrazole derivatives. Among them, flufiprole was launched successfully in 2012, and it is predicted that pyriminostrobin (SYP-11277) will be commercialised before the end of this year. Other patented molecules, including cyclozaprid, have been developed.

**Herbicides:** Applications have so far been made for 22 PCT patents, and the most popular are dicarboximide compounds. Pyribambenz-propyl (ZJ0273) and pyribambenz-isopropyl (ZJ0272), invented by Shanghai Institute of Organic Chemistry and Zhejiang Research Institute of Chemical Industry, have been registered and commercialised in China. More molecules are in the pipeline.

There have been 37 patents so far granted in China. The most prolific researcher has been the R&D director at the SYRICI, Professor Changling Liu, who has accounted for 24 of them.

US patents have been granted for 13 ais. Dr Liu received eight of those. Other researchers receiving one patent each were Zhong Li (professor in the school of pharmacy at the East China University of Science and Technology), Long Lu (Shanghai Institute of Organic Chemistry), Chunhe Yang (professor at SYRICI), Guangfu Yang (professor at Huazhong Normal University), and Xinzhuo Zou (professor at East China Normal University).

Among 87 filed patent applications, many of them being joint applications by institutions, the Sinochem group accounts for 34. The SYRICI follows with 31 applications. Among other prolific assignees are: Hunan Research Institute of Chemical Industry with 13 PCT patents; Eastern University of Science and Technology with ten PCT patents; and Huazhong Normal University with five PCT patents. Zhejiang Research Institute of Chemical Industry, Dalian Raiser Pesticides, Jiangsu Yangnong Chemical, Shanghai Institute of Organic Chemistry and Nankai University filed three applications each.

The detailed list of the patents is available at: <https://www.agra-net.net/agra/agrow/databases/agrow-intelligence-patent-watch/article128359.ece/BINARY/Newly+Patented+Agrochemicals+Invented+by+Chinese+Research+Groups>