

Date of first publication in IRRI Website	11 September 2017
Edited Publication and Publication Date in IRRI website	14 June 2019
Title of the Application	Breeding Methods for Enhanced Grain Yield and Related Materials and Methods
Application Date	03 February 2014
Application Number	PCT/IB2014/000607
Publication Number	WO/2014/118636
Publication Date	07 August 2014

Link to the WIPO Website

<https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2014118636&redirectedID=true>

Status of the Applications National phase applications in India, Philippines, Thailand, USA, China and Vietnam were abandoned in 2017; for Brazil application, it was abandoned in 2016

BACKGROUND

Total spikelet number per panicle (“TSN”) is one of the key traits that determine grain productivity in rice (*Oryza sativa* L.). Using the tropical *japonica* variety “Daringan”, as a donor parent, the team of Dr. Tom Ishimaru at IRRI, in collaboration with Japan International Research Center for Agricultural Services (JIRCAS) and the National Agriculture and Food Research Organization (NARO), discovered the *SPIKE* gene that initially appeared to have the potential to increase grain yield of *indica* varieties.

In the patent application based on initial results, a gene, *SPIKE* (or “SPIKELET NUMBER”), was found to apparently enhance grain yield of *indica* cultivars, through pleiotropic effect on plant architecture. Phenotypic analyses of near-isogenic lines (“NILs”) based on the popular *indica* rice cultivar IR64 carrying *SPIKE* initially revealed increased spikelet number, enlarged leaf size, enlarged root system, and an increased number of vascular bundles, indicating the enhancement of source size and translocation capacity as well as sink size. In controlled trials, the Spike NIL line achieved a 20% yield increase, with no negative effect on grain appearance. Expression analysis also revealed that *SPIKE* was ubiquitously expressed in panicles, leaves, roots, and culms. In initial experiments, *SPIKE* was found to increase grain yield by up to 18% in the released *indica* cultivar IRRI 146.

Based on those initial results, a patent application was initiated. Also, NILs for *SPIKE* were made available to partners under non-exclusive R&D licenses, granted free of charge, with the aim to reproduce yield experiments. *SPIKE* licenses granted by IRRI were non-exclusive R&D licenses only, with no

commercial rights granted. In parallel, IRRI conducted additional agronomic trials. The new agronomic experiments, performed at larger scale, and in different agro-climatic conditions, finally showed that a consistently significant and reliable increase in yield could not be achieved. The continuation of the patenting and licensing strategy was not justified, and the patents have been allowed to lapse.

CURRENT STATUS OF PATENT APPLICATIONS

In 2014, a PCT application was filed relating to SPIKE gene. From there, seven (7) National Phase patents were derived and filed in India, Philippines, Thailand USA, China, Vietnam and Brazil. On the other hand, JIRCAS 100% owns and manages the patent application filed in Japan.

Filing Date	Filing Place	Application Number	Publication Date	Publication Number	Publication Link in the WIPO website	Status
26/08/2015	India	7614/DELNP/2015	22/01/2016	7614/DELNP/2015	https://patentscope.wipo.int/search/en/detail.jsf?docId=IN211707905&redirectedID=true	Abandoned on 03/12/2017
03/02/2014	Philippines	1/2015/501686	19/10/2015	1/2015/501686	https://patentscope.wipo.int/search/en/detail.jsf?docId=PH203085385&recNum=3&office=&queryString=FP%3A%28Breeding+Methods+for+Enhanced+Grain+Yield+and+Related+Materials+and+Methods%29&prevFilter=&sortOption=Pub+Date+Desc&maxRec=4	Abandoned on 03/12/2017
03/02/2015	Thailand	1501004378	-	-	-	Abandoned on 27/07/2017
03/02/2014	USA	14765339	31/12/2015	20150376638	https://patentscope.wipo.int/search/en/detail.jsf?docId=US153999942&tab=NATIONALBIBLIO&maxRec=1000	Abandoned on 03/12/2017
03/02/2014	China	201480018617.4	27/01/2016	105283069	https://patentscope.wipo.int/search/en/detail.jsf?docId=CN159806534	Abandoned 03/02/2017
03/02/2014	Vietnam	1201503209	25/12/2015	45055	https://patentscope.wipo.int/search/en/detail.jsf?docId=VN202166976	Abandoned 03/02/2017
31/07/2015	Brazil	BR 11 2015 018370 0	-	-		Abandoned on 08/2016

Furthermore, IRRI, as a non-profit international organization, promotes responsible technology transfer and intellectual property management, in accordance with its Intellectual Property and Commercialization Policy (IP&C Policy)¹ and with the CGIAR Principles on the Management of Intellectual Assets (“IA Principles”)².

¹Available at <http://books.irri.org/Approved-IPC-Policy-291017.pdf>

²Available at <https://cgspace.cgiar.org/bitstream/handle/10947/4486/CGIAR%20IA%20Principles.pdf?sequence=5>