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Protection of plant varieties: systems across countries

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Abstract

This study discusses some of the important aspects of laws/regulations formulated for the protection of plant varieties in Union for the Protection of New Varieties of Plants (UPOV) member states, European Community countries and India. The study also provides an insight into some of the unique features of Indian *sui generis* system for the protection of plant varieties. During this study, the registration of crop notified in India and in some selected UPOV member countries has been examined. Since India is not an UPOV member state, the system of plant variety protection (PVP) is independent of international scenario but aims for similar standards. The study provides useful information in order to analyse the implementation of PVP laws in UPOV member states and India. Some important features were selected for carrying out a comparative analysis. These include Intellectual Property Rights protection (patent/breeder's right), types of varieties protected, methods of testing, criteria for protection, duration of protection, exemptions (researcher/farmer's exemption), infringement and penalty and compulsory license.

Keywords: Community Plant Variety Right; Convention on Biological Diversity; European Community; plant variety protection; Trade Related Aspects of Intellectual Property Rights

Introduction

Plant Genetic Resources were treated as the 'heritage of mankind' and were shared freely among nations, until the concerns for conservation of biological diversity were raised by the Convention on Biological Diversity (CBD), which came into force in 1993. The conservation, sustainable utilization and access to biological diversity were considered as national sovereignty by CBD. Consequently, many issues regarding the 'rights of the conservers, users, breeders, farmers and intellectual property have emerged' (Brahmi *et al*., 2004).

The rights of plant breeders and 'intellectual property' applicable to plant varieties were formalized through the establishment of International Union for the Protection of New Varieties of Plants (UPOV), an intergovernmental organization established by the International Convention for the Protection of New Varieties of Plants in 1961 with the objective that members of the union acknowledge the achievements of the breeders of the new varieties of plant by granting them an intellectual property right for a given period of time and by encouraging the development of new varieties of plants for the benefit of society. The convention entered in force in 1968 with the ratification from Denmark, Germany, the Netherlands and the UK. It was revised in 1972, 1978 and 1991. The UPOV convention sets out a minimum scope of protection to plant varieties and allowed member states to formulate their national plant variety protection (PVP) laws in accordance with national or regional circumstances. By becoming a member of UPOV, a state or an intergovernmental organization provides its plant breeders the possibility of obtaining protection in the territories of other members and provides an incentive to foreign breeders to invest in plant breeding (UPOV, 2009a).

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In July 2005, the European Community (EC) became the first intergovernmental organization to join the UPOV. The EC became the 59th member of the union, and before joining UPOV, the plant varieties protection in EC was harmonized at community level. It was governed in accordance with Council Regulation (EC) no. 2100/94, 1994. Community Plant Variety Office (CPVO) in Angers (France) is responsible for implementation and grant of Community Plant Variety Right (CPVR). As CPVR is valid throughout the community, nationals of the EC have the choice to apply for protection of their varieties either at community level or limit the protection to the national level.

In the Uruguay round of General Agreement on Tarrifs and Trade in 1994, for the first time, trade related to agriculture, services and intellectual property rights (IPR) was discussed. It finally ended with the establishment of World Trade Organization (WTO) and signing of agreement on Trade-Related Aspects of IPR (TRIPs) Agreement. According to Article 27.3(b) of the TRIPs Agreement, the member countries are required to provide protection to plant varieties either by a patent or by an effective *sui generis* system or by any combination thereof (TRIPs, 1994). In order to comply with these requirements, some WTO member countries joined UPOV and formulated their own PVP laws in accordance with UPOV Act 1978/1991, while others such as India and Zimbabwe have developed their PVP laws in 2001 and 1974, respectively, under *sui generis* option.

The main objective of this study is to analyse the implementation of PVP laws in UPOV member states, European Union member states and India. The other objectives of this study are to identify the taxa protected in UPOV member states and India and to report the status of registration of crops notified in India.

The authors studied the laws formulated for the protection of plant varieties by all the UPOV signatories and the Community PVP Law of EC. UPOV Publications on 'Laws and Treaties', Community Plant Variety Office (CPVO) and the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Authority, India, websites were used for the study material. An earlier policy brief no. 11 (Ravishankar *et al*., 2000), published by the Indian Council of Agricultural Research (ICAR) in 2000, which was undertaken before the enactment of the PPV&FR Act of India, is the basis of this study. The analysis for taxa protected in UPOV member states is based on the data obtained from the Forty-Third Ordinary Session of UPOV held in Geneva on 22 October 2009. The information of crops notified for registration by PPV&FR Authority, India, is taken from Gazette notification available on PPV&FR Authority website (www.plantauthority.gov.in). The analysis of registration of crops notified in India in 12 selected countries of UPOV and India is based on the results obtained from database developed or information available on the websites of the respective UPOV member states and India.

Analysis of implementation of PVP laws in UPOV member states in accordance with UPOV Act 1978/1991

At present, 68 countries are members of UPOV of which 63 countries had formulated their laws in accordance with the UPOV Act 1978/1991 as available in UPOV Publications (UPOV Publications, Laws & Treaties). PVP laws of the rest of the countries were not available in UPOV Publications. UPOV Act 1991 (International Union for the Protection of New Varieties of Plants of December 2, 1961, as Revised at Geneva on November 10, 1972, on October 23, 1978, and on March 19, 1991) had extended the scope of protection to plant varieties in comparison with its predecessor, the UPOV Act 1978, where the UPOV Act 1978 required its member states to provide protection to at least five genera or species on the date of ratification to the Act that will end with 24 genera or species within 8 years. The UPOV Act 1991 extended the genera or species to at least 15 upon ratification or acceding to the Act that will extend to all plant varieties within 10 years (Art. 3(2) of UPOV Act 1991). The UPOV Act 1991 has clearly defined what is a plant 'variety' thus defined the characteristics of plant grouping that qualify for protection. The UPOV Act 1978 did not allow dual protection (protection to plant varieties either with a distinct breeder's right or with a patent but not with both), but the UPOV Act 1991 had permitted the dual protection of varieties with both breeders' right and patent. The UPOV Act 1991 defined the requirement of protection to discovered varieties by defining 'breeder' as 'a person who bred, or discovered and develop a variety'. It was not clearly defined in the UPOV Act 1978. In the UPOV Act 1991, breeders' exclusive right had also been extended to propagating and harvesting material also, provided the harvest had been obtained through an unauthorized use of propagating material, and the breeder had not got a reasonable opportunity to exercise his or her right in relation to that material. Whereas accession to the UPOV Act 1978, breeders' rights were granted only on conditions of reciprocity (grant of some exclusive rights, more than the rights required under the treaty to the breeders of a specific genus or species of one country), provided such rights to be extended only to those member states that provided such additional exclusive rights to the nationals of said country in respect of same genus or species (Arts. 3 and 5(4) of UPOV Act 1978). The UPOV Act 1991 had provided the provision of national treatment (each country, as being a member of UPOV, to be given the same treatment to a natural person of the contracting party as is given to its

own nationals in respect of protection of breeders' rights). In comparison with the UPOV Act 1978, the duration of protection had extended from 18 years to 25 years for trees and vines and from 15 years to 20 years for other varieties in the UPOV Act 1991. The UPOV Act 1991 clearly defined the limitation of breeders' right, i.e. the use of new varieties for private, non-commercial activities are outside the scope of breeders' right. Whereas the UPOV Act 1991 provided a provision of research exemption and accession to which breeder cannot restrict 'acts done for experimental purposes', provided the research and testing of protected varieties were only for scientific purpose and did not lead to commercial exploitation. Like its predecessor, the UPOV Act 1991 recognized the right of breeders to use protected varieties to create new varieties. However, this exemption was itself restricted to such new varieties that are not 'essentially derived' from protected varieties (Article 14(5) and 15). The UPOV Act 1991 limits farmers' privilege as farmers were no longer authorized to sell or exchange seeds with other farmers for propagation purposes as was allowed in the UPOV Act 1978. Although according to the UPOV Act 1991, farmers were allowed to use the product of harvest of a protected variety for propagation purposes 'on their own holdings', but it must be in reasonable limits, i.e. member states were required to restrict the acreage, quantity of seeds and species subject to the farmers' privilege so as to safeguard the legitimate interest of breeder of protected varieties. As of October 2009, 68 countries were parties to UPOV – 22 to the 1978 Act, 45 to the 1991 Act and one to the 1961/1972 Act. (States parties to the UPOV, status on 22 October 2009). As a result, this study was focused on the two most recent UPOV Acts. The 1991 Act entered into force on 24 April 1998, and on that same date, the 1978 Act was closed to future accessions except by a few states already in the process of adhering to it.

Form of IPR protection (patent/breeder's right)

As the UPOV Act 1991 removed the 1978 Act's ban on dual protection, thus member states were permitted to protect the same plant variety with both breeders' right and as patent. Of the 63 countries that are members of UPOV, 12 countries, namely Azerbaijan, Belarus, Bulgaria, Hungary, Italy, Kyrgyz Republic, Republic of Moldova, Romania, Russian Federation, Ukraine, the USA and Uzbekistan, provide both forms of protection to plant varieties by granting patent too, while the rest grant only breeder's right (Table 1).

Type of varieties protected

As the UPOV Act 1991 required at least 15 plant genera or species to be protected upon ratification or acceding to the Act, it will extend to all plant varieties within 10 years (Article 3 of the UPOV Act 1991). In order to comply with such requirement, most of the UPOV signatories provide protection to new and essentially derived varieties (EDVs) of all plant genera and species. However, the mechanism of granting IPR in plant varieties is by periodic notification of plant varieties eligible for protection by the governing body (authority/government) of the member country. Countries such as Belarus, Brazil, China, Croatia, Ireland, Jordan, Kenya, Republic of

Table 1. List of countries providing protection by patents/breeder's right

Patent	Breeder's right		
Azerbaijan	Argentina	Georgia	Poland
Belarus	Australia	Germany	Portugal
Bulgaria	Austria	Ireland	Singapore
Hungary	Bolivia	Israel	Slovakia
Italy	Brazil	Japan	Slovenia
Kyrgyz Republic	Canada	Jordan	South Africa
Republic of Moldova	Chile	Kenya	Spain
Romania	China	Latvia	Sweden
Russian Federation	Colombia	Republic of Korea	Switzerland
Ukraine	Costa Rica	Republic of Lithuania	Trinidad and Tobago
USA	Croatia	Mexico	Tunisia
Uzbekistan	Czech Republic	The Netherlands	Turkey
	Denmark	New Zealand	UK
	Ecuador	Nicaragua	Uruguay
	Estonia	Norway	USA
	European Union	Oman	Vietnam
	Finland	Panama	
	France	Paraguay	

Source: UPOV Publications, Laws & Treaties: PVP Laws.

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Korea, Romania, Russia and others also provide information about selected genera to which protection was provided at the time of this study as specified by the respective authority/government. Countries such as Kenya and Paraguay also provide a list of species, excluded from protection along with the species notified for registration. In Slovakia, any industrially produced microorganism, biotechnological procedure and product obtained, which were subject matter of patent, were excluded from variety protection as mentioned in Article 1.3 of Slovakia Act on the Protection of Rights of New Varieties and Animal Breeds, 1989. In the USA, new and EDVs of sexually reproduced/tuber-propagated varieties were protected under PVP laws, and the varieties developed by asexual reproduction were protected under Plant Patent Law of United States Code (USC) title 35.

A variety, which had already been offered for sale before the date of making application (i.e. the applicant variety is not new and has been named as 'extant' variety in Indian law), can be registered in Bolivia, Brazil, China, Colombia, Czech Republic, Ecuador, Estonia and Republic of Korea, provided the application for the grant of breeders' rights be made within the said duration as prescribed by the respective government/authority. In some countries, namely Australia, China, Singapore, algae and fungi were also protected under PVP laws. In Finland, Nicaragua, Panama, China, the USA and others, the PVP law extends protection to ornamental plants also (UPOV Publications, Laws & Treaties).

Criteria for protection

In most of the UPOV signatories, the criteria for the grant of breeder's right was the same as mentioned in Chapter III of the UPOV Act 1991, i.e. new varieties must possess novel, distinct, uniform and stable (NDUS) features to be eligible for registration under PVP laws. However, there are few exceptions, for example, in Paraguay, varieties commercialized in the country for at least 3 years prior to the introduction of Law no. 385/94 were only eligible for registration. In the USA, although the criterion of protection as NDUS for sexually reproduced/tuber-propagated varieties registered under PVP laws is maintained for asexually reproduced varieties, the variety must possess novel and distinct features for the grant of patent. However, the condition of uniformity and stability is not defined in the USA Patent Act, provided the applicant variety meets the conditions and requirements of USC Title 35 (35 USC, 161 Patents for plants). For countries providing protection to extant variety, there was flexibility in novelty requirement, but possession of distinct, uniform and stable (DUS) features was same as that for a new variety. For example in China, if the application for breeders' right had been filed within 2 years from the date of publication of the list of protected new varieties, the variety was registered as extant variety, provided the propagating material of the applicant variety had not been put for sale for more than 4 years within the territory of China. (UPOV Publications, Laws & Treaties).

Method of testing

In order to grant breeder's right, the candidate variety was required to undergo a technical/substantive examination by a domestic or foreign institution recognized by the government/authority of the UPOV member state for compliance with the Article 5–9 of the UPOV Act 1991. It involves laboratory tests and growing of the applicant variety in the fields. For this purpose, the applicants were required to furnish all the necessary information, documents or propagating material to the competent national authority. The quantity of material to be deposited is decided by the said authority. Most of the UPOV members accept the results of DUS tests/trials carried out by the foreign organization (UPOV/non-UPOV) for the applicant variety. Other countries, namely Azerbaijan, Bolivia, Brazil, Canada, Chile, China and others, do not provide details of such provision in their Act. This makes the system cost effective, as members are able to minimize the cost of operating their protection systems, and breeders are able to obtain protection in several territories at a relatively low cost. (UPOV Publications, Laws & Treaties). However, India being a non-signatory to UPOV, DUS tests/trials are conducted by the PPV&FR Authority at authorized DUS centres only.

Duration of protection

Most of the UPOV members followed the duration as suggested by the UPOV Act 1991, i.e. the minimum duration of protection for trees and vines is 25 years, and for the remaining genera or species, it was 20 years. However, there were a few exceptions, for example in Brazil, Canada, Chile, China, Hungary, Kenya, Mexico, Paraguay and Uruguay, the duration of protection for trees and vines is 18 years and 15 years for other species. In some other countries such as the UK, Kyrgyz Republic, Ireland, Russian Federation, the maximum duration of protection was 35 years for trees and vines and 30 years for other species. In the entire UPOV member states, after the expiry of said duration, the variety passed into the public domain, i.e. breeders' right no longer existed, and the variety could be used freely by any person for research, breeding or propagation purposes (UPOV Publications, Laws & Treaties).

Researcher/farmer's exemption

With most of the UPOV members, the use of protected varieties for carrying out scientific research, for private non-commercial purposes and for breeding other plant varieties was not considered as infringement on the breeders' right (Article 15 of the UPOV Act, 1991). This included the use of seed or propagating material of the protected variety for carrying out experiments in laboratory or for using it as parental material for the development of new variety through breeding. Paraguay did not define this provision in the Act. The optional exemption to permit the farmers to use the product of the harvest obtained for further propagation on their own holdings, [A.15 (2) of the UPOV Act, 1991] was provided by the majority of UPOV members. However, the farmers' exemption to use further the farm-saved seed was provided with certain conditions: In Kyrgyz Republic, Russian Federation and Uzbekistan, farmers' exemption was only for 2 years for selected plant genera as specified by the Government, while in rest of the UPOV signatories providing farmers' exemption, complete exemption to use farm-saved seed was provided only to small farmers (those possessing a smaller area/hectares of land as decided by the governing body) along with the list of species to which exemption is extended as provided by the government/authority. Farmers who were not included in the list were required to pay remuneration to the breeder of the registered variety if they use the farm-saved seed of protected variety for further propagation on their own holdings. However, the amount of remuneration was less than the amount paid if the protected variety was grown for producing propagating material of the respective variety according to a license agreement between breeder(s) of that protected variety and the farmer in the same region. Some countries such as Turkey, Ukraine and the European Community had restricted small farmers' exemption in terms of the amount of saved seed. Farmers producing a maximum amount of 92 tonnes were completely exempt from payment of remuneration to the breeder (UPOV Publications, Laws & Treaties).

In South Africa, farmers' exemption was extended to the right to resell the farm-saved propagating material, and to sell any plant, reproductive material or product derived from that propagating material for purposes other than the further propagation or multiplication thereof [S.23 (6) of Plant Breeder's Rights Act No. 15 of 1976, Republic of South Africa].

Infringement and penalty

Any person who sells, offers for sale, reproduces, imports or exports, or packs or holds in the storage for such purposes, or supplies the propagating material of a protected plant variety for any purpose, either under the correct designation or any other, without being authorized to do so by the holder thereof, would be considered as infringement of breeders' rights and is punishable in most of the UPOV member states. Similarly a person who wrongfully claimed to be a breeder of a registered variety or made false use of denomination of registered variety was punishable in all the UPOV member countries. An action for infringement of breeder's right in a plant variety would begin in the Court only by the holder of breeder's right. The punishment was given either in the form of fine or by imprisonment or by both depending upon the type of infringement. For example, in Australia, any person violating the breeders' rights was penalized with 500 penalty units, and for non-infringement acts (offence) such as making false statement in application with 6 months imprisonment, for wrongly representing to be the first breeder of the registered variety with 60 penalty units. In Canada, for both infringement and non-infringement acts, the infringer/offender was penalized with a fine of 5–15,000 dollars or with an imprisonment of 3–5 years or with both depending upon the extent of infringement/offence. In countries such as Columbia, Japan, Jordan, Korea, Kenya and others, the infringement cases were dealt under civil or criminal procedure (UPOV Publications, Laws & Treaties).

Compulsory license

If the seed or propagating material of the protected variety was not available to the public in sufficient quantity and at a reasonable affordable price, then after a defined period, the compulsory license was granted in respect of the same variety to the interested party. In most of the UPOV signatories, the compulsory license was granted in the form of a non-exclusive license and is granted after 3 years from the date of registration of the protected variety; however, in some countries such as Australia, compulsory license was granted after 2 years from the date of registration, provided the breeder of the said variety must receive a reasonable royalty as decided by the authority that issued the compulsory license. (UPOV Publications, Laws & Treaties).

Community Plant Variety Right under Council Regulation (EC) no. 2100/94

The EC was the first intergovernmental organization to join the International UPOV on July 29, 2005. It became the 59th member of the union. Before joining UPOV, the PVP within the community was governed by Council Regulation (EC) no. 2100/94 on Community CPVR

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adopted on 27 July 1994. It was a uniform system, which, although co-exist with the national regimes, allowed for the grant of industrial property rights valid throughout the community. However, cumulative protection was prohibited, i.e. any variety, which was a subject matter of CPVR, would not be the subject of a national plant variety right or any patent for that variety. Any right granted contrary to this would be ineffective. If the holder had been granted another right before CPVR, he would be unable to invoke the rights conferred by such protection for the variety for as long as the community plant variety right remained effective (Article 92 of Council Regulation (EC) no. 2100/94 of 27 July 1994 on Community plant variety rights).

In order to implement the provisions of this regulation, a CPVO was established in April 1995 with head office in Angers (France) along with the administrative council as a subsidiary body. The provisions of Council Regulation (EC) no. 2100/94 for the protection of plant varieties were based on UPOV convention, the convention of the Grant of European Patents (European Patent Convention) or the agreement on TRIPs, including trade in counterfeit goods.

Any natural/legal person of the EC or UPOV member state would file application for CPVR in respect of any new or EDV of all genera and species possessing DUS features. For applicants of other states, the application would be made after obtaining the opinion of the administrative council. Upon acceptance, the application was subjected a formal and substantive examination to check whether the application was in accordance with the act. When the application was found to be correct, there would be a technical examination of the applicant variety involving the testing of the variety in accordance with the prescribed test guidelines to score and record DUS features. When the results of technical examination were found to be appropriate, the CPVR is granted and prescribed particulars are entered in the register of CPVR. The CPVR was granted for a period of 30 years in case of trees and vines and 25 years in case of other species, following the year of grant. Breeders' rights granted under CPVR were same as that of the UPOV Act 1991. Exemptions to breeders' rights were similar to that of the UPOV Act 1991. For public interest and after consulting the administrative council, compulsory exploitation rights would be granted to one or more persons by the office for 1 year that will be cancelled or amended thereafter, provided the breeder of the protected variety in respect of which compulsory license was given would obtain equitable remuneration during that period. Any person infringing breeders' rights or making false use of the denomination of registered variety would be sued by the breeder of that registered variety and would be liable to pay compensation for the damage caused by such infringement.

PVP in India

In India, new, extant, EDVs and farmers' varieties of crops notified in India were eligible for registration under PPV&FR Act 2001, wherein crops notified in India meant the plant genera or species notified for registration by the central government in PPV&FR Authority Gazette periodically. Any person claiming to be the breeder of the variety/successor or assignee of the breeder/any university- or public-funded agricultural institution could apply in the prescribed manner for the registration of any new, extant, EDVs developed. Farmer or group of farmers were also eligible to apply for the registration of any new, extant, EDVs or farmers' variety developed, wherein a farmers' variety was a variety that has been traditionally cultivated and evolved by the farmers in their fields or is a wild relative or landrace of a variety about which the farmer possessed the common knowledge. Farmers were exempted from any kind of fee charged for registration and maintenance of a registered variety.

Where an application for registration of a plant variety of notified crop had been made by a national of a convention country, i.e. a country that was a party to an international convention, of which India was a party or a country with which India had signed a bilateral agreement on protection of plant varieties, the application would be registered on the same date on which application was made in the convention country, provided the application was made within 12 months from the date of filing in the convention country. Any country which did not accord national treatment to the citizens of India, in respect of variety registration and protection, would not be entitled either solely/jointly to apply for registration of a variety in India. In order to get registered under this Act, the candidate variety (new and EDVs) must possess NDUS features, whereas for registration as an extant variety, the candidate variety must possess DUS characters. The registrar would register extant varieties within 3 years from the date of its notification. The application would submit an affidavit sworn by the applicant stating that the applicant variety does not contain any gene or gene sequence involving terminator technology (PPV&FR Act, 2001).

Before getting registered, the candidate variety was required to undergo DUS testing involving field and multi-location trials in accordance with the prescribed DUS guidelines as developed and notified for each crop by the PPV&FR Authority, for at least two seasons and on a minimum of two locations (Section 19 and Rule 29 of Protection of Plant varieties & Farmers' Right Authority: The Protection of Plant Varieties and Farmers' Rights Rules, 2003). To date, for all genera and species notified by the Central Government, DUS test guidelines and the sites where DUS tests would be carried out had been

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notified. These DUS guidelines had more or less followed the UPOV guidelines. To date, UPOV had provided test guidelines for approximately 300 crop species. It includes 17 crop species notified in India; however, for the rest of species of crops notified in India such as *Cajanus cajan*, *Vigna radiata*, *Vigna mungo*, *Pisum sativum*, *Corchorus olitorius*, *Corchorus capsularis*, *Curcuma longa*, *Piper nigrum*, *Elettaria cardamomum*, *Brassica juncea*, *Brassica carinata*, *Brassica napus*, *Ricinus communis*, *Sesamum indicum*, the DUS guidelines have been formulated using crop expertise available in India. Upon registration, the variety would be protected for a total duration of 18 years for trees and vines and 15 years for other varieties (including extant varieties). The certificate of registration issued would be valid for 9 years in case of trees and vines and 6 years in case of other crops and would be reviewed or renewed for the remaining period on payment of prescribed fee. Any person violating the breeders' right would be sued by the holder on filing a suit for infringement in any court inferior to the District Court. At the same time, any person who applied false denomination to a variety or provided false information in the course of trading would be punishable with an imprisonment of not less than 3 months (maximum 3 years) and with a fine of not less than 50,000 (maximum 500,000 rupees) or with both. If the seed/propagating material of a registered variety was not available to the public at a reasonable and affordable price, any person interested, after the expiry of 3 years from the date of registration, would file an application for the grant of a compulsory license to the Authority (PPV&FR Act, 2001).

Under PPV&FR Act, some rights termed as Farmers' Rights under Chapter VI of PPV&FR Act 2001 had been included in the Act after many deliberations, owing to the fact that India has an agriculture-based economy and majority of its population depends on agriculture to meet their basic needs. Also, most of the Indian farmers possess very small and marginal land holdings and lacks financial capability to purchase seeds of protected varieties. Keeping this in view and considering the important role the farmers have played to conserve and enrich varieties and contributed towards total genetic variability of the country, these rights have been included in the Indian Act. These included the right to save seed from one's crop and use it for sowing, exchanging, sharing or selling to other farmers except as branded seeds. The Act provided for equitable sharing of the benefits earned from the registered new variety with farming or tribal communities that had contributed varieties used as parents in the development of new registered variety. Claims for benefit sharing had to be made within 6 months from the date of advertisement inviting such claims by the Authority. On examination, if the authority was satisfied, the breeder of the respective registered variety was required to remit the awarded benefit share in the 'National Gene Fund' that would further be disbursed to the eligible individual, community or institution. In view of low legal literacy of tradition-bound Indian farmers and to discourage petty legal harassment to farmers from seed companies, a safeguard to the farmer against 'innocent infringement' had also been provided in the Act. 'Innocent infringement' means violation of any of the exclusive rights of the breeder of registered variety unknowingly (Ravi, 2004). One of the common example of innocent infringement in India was carrying of farm-saved seeds/propagating material of any variety in gunny bags of a registered variety, provided the respondent farmer would have to make affirmation that he was not aware of the legal provision deemed to have been violated by him at the time of such commission. Apprehensions about proving such innocent infringement in court of law had also been expressed by some quarters, but actual case studies (if any) in future would define the implementation of such sections of the PPV&FR Act.

In order to check unfair marketing practices by breeders and seed sellers, the act required the seed to be sold with a declaration on its agronomic performance and the cultivation conditions ensuring this performance. In the event, farmers were not able to achieve the claimed performance on having cultivated under the specified conditions, the breeder (holder of breeder's right) would be made liable to pay compensation to the affected farmers.

Table 2. List of countries providing protection to selected genera and species

Albania
Azerbaijan
Belgium
Brazil
Belarus
China
Croatia
Ireland
Jordan
Kenya
Kyrgyzstan
Republic of Korea
Lithuania
Morocco
Panama
Paraguay
Singapore
Turkey
Trinidad and Tobago
Uzbekistan
Vietnam
South Africa

Source: Forty-third Ordinary Session, 2009.

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Table 3. List of Indian notified crop varieties protected in countries providing protection to selected plant genera

	Country code[a]																					
Crop	AL	AZ	BE	BR	BY	CN	HR	IE	JO	KE	KG	KR	LT	MA	PA	PY	SG	TR	TT	UZ	VN	ZA
Black gram																						
Bread wheat	*	X	X	X	X	X	X	X	X	X	X	*	X	X		*		X		X		*
G. barbadense L.				X		X					X	*		X		*		*	*	*		
G. hirsutum L.		X		X		X				X	X	*		X		*		*	*	*	X	X
Chickpea									X		X	*		X				X		X		
Field pea	X		X		X	X	X	X			X	*	X	X				X		X		*
Green gram						X						*								X		
Jute																						
Kidney bean	X	X	X	X	X	X				X	X	*	X	X	X	X		X				X
Lentil	X				X				X			*		X				X				
Maize	X	X	X	X	X	X	X	X		X	X	*		X	X	X		X		X	X	X
Pearl millet				X								*									X	X
Pigeon pea				X								*										
Rice				X		X					X	*			X	X		X		X	X	X
Sorghum Moench				X								*				X						X
S. bicolor L.				*		X					X	*			X	*				X		X
Sugarcane				*		*				*		*			X						*	X
Turmeric																						
Ginger												*									X	
Black pepper																						
Small cardamom																						
Indian mustard						X					X	*										X
Karan Rai																						
Rapeseed												*										X
Gobhi Sarson						X					X	*										
Sunflower	*		X				X	X			X	*		X		X		X		X		X
Safflower											X	*	X	X				X				
Castor												*										X
Sesame						X						*						X				
Linseed			X		X	X		X				*	X	X								
Groundnut						X					X	*						X		X	X	X
Soybean				X	X	X	X				X	*		X		X		X		X	X	X

AL, Albania; AZ, Azerbaijan; BE, Belgium; BR, Brazil; BY, Belarus; CN, China; HR, Croatia; IE, Ireland; JO, Jordan; KE, Kenya; KG, Kyrgyzstan; KR, Republic of Korea; LT, Lithuania; MA, Morocco; PA, Panama; PY, Paraguay; SG, Singapore; TR, Turkey; TT, Trinidad and Tobago; UZ, Uzbekistan; VN, Vietnam; ZA, South Africa; X, protected taxon.

Source: data obtained from Forty-third Ordinary Session of UPOV, 2009.

*Protected taxon as a result of the protection of a taxon of a higher rank to which it belongs (for example in the case of a species: the genus or family to which it belongs is protected).

[a] Country code of the countries providing protection to selected genera and species as mentioned in Table 2.

Table 4. Countries with online search database

Australia	http://pbr.ipaustralia.plantbreeders.gov.au/
Canada	http://www.inspection.gc.ca/english/plaveg/pbrpov/cropreport/gsae.shtml
Czech Republic	http://nou.ukzuz.cz/ido/index.html?PHPSESSID=du1bbpha93c3pl5b798u71ttq7&lang=en&id=&chb0=t&chb1=t&chb2=t&chb3=t
European Community	http://www.cpvo.europa.eu/main/en/home/databases/applications-and-titles-inforce
New Zealand	http://www. iponz.govt.nz/cms/pvr/how-to-apply-for-a-plant-variety-right
Poland	http://www. coboru.pl/English/aindex.htm
Republic of Slovenia	http://spletni2.furs.gov.si/sorte/Index.htm
USA	http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateC&navID=PVPOPublicAccessDatabase&page=PVPOPublicAccessDatabase&description=PVPO-Public%20Access%20Databases

Source: About UPOV, http://www.upov.int/en/about/members/pvpoffices.htm.

The Central Government had constituted a National Gene Fund to promote on farm and *ex situ* conservation by individuals, communities, panchayats (local village bodies elected for self-governance recognized by law in India) and institutions as per provisions of the Act. The fund would be used for rewarding and recognizing conservation undertaken by individuals and communities and to disburse the pronounced benefit shares and compensations.

The farmers' rights section of the PPV&FR Act 2001 stated that the seeds of the registered varieties should be made available to the farmers in sufficient amount and at a reasonable price. However, if the breeder had not satisfied the requirement for 3 years after registration, the farmers would have the right to take the matter of non-availability to the PPV&FR Authority (Ravi, 2004).

Plant species protected in UPOV member states and India under PPV regulation

In UPOV member states

UPOV member states that are bound by the Act of 1961/72 or 1978 Act were required to apply the provisions of UPOV Act 1991 to all plant genera and species on the date on which it became the member of UPOV or latest by the expiration of 5 years after the said date. Country

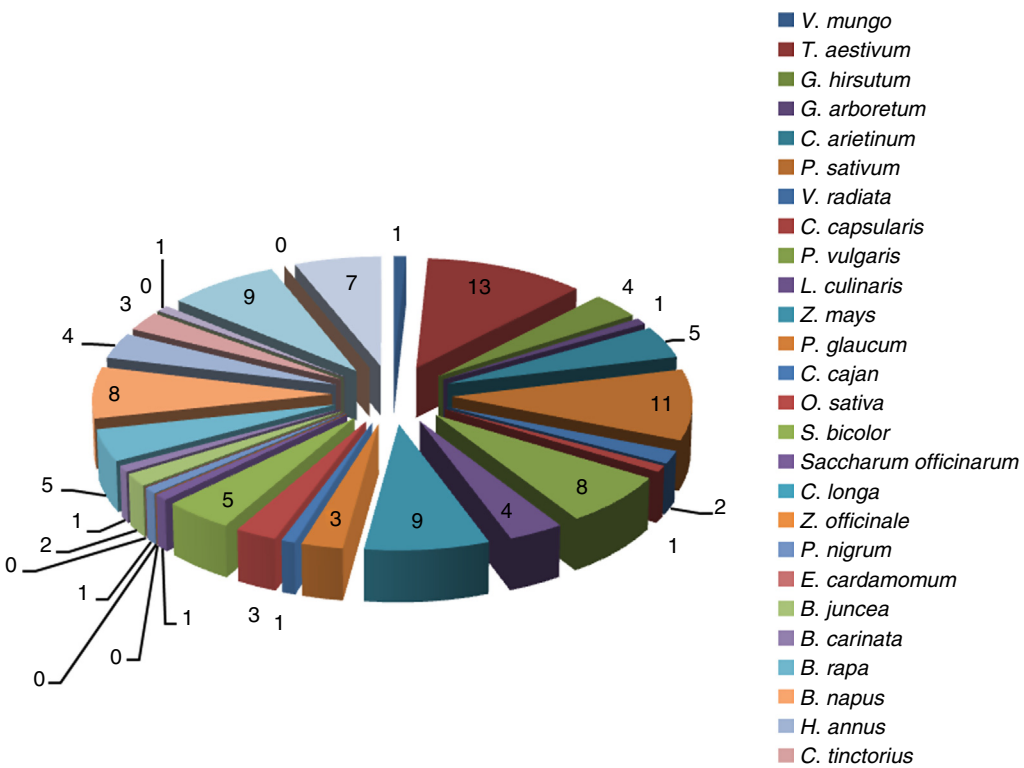

Fig. 1. Number of countries in which crops notified in India that were registered (A colour version of this figure can be found online at journals.cambridge.org/pgr).

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(ies) bound only to UPOV Act 1991 would apply the provisions of this Act to at least 15 plant genera and species at the time of joining UPOV and to all plant genera and species at the latest by the expiration of 10 years from the date of joining UPOV Act 1991 (Article 3, UPOV Act, 1991).

According to Forty-third Ordinary Session of UPOV held in Geneva on October 2009, the list of taxa protected by the members of the UPOV was reported. According to the said report, most of the UPOV countries provide protection to all plant genera and species. However, only few countries (Table 2) were providing protection to selected genera and species.

In India

The crop varieties notified in India that were protected in these countries (Table 3) were as follows:

To date, 28 crops (34 species) have been notified by the Central Government in four Gazette notifications published by PPV&FR Authority (Protection of Plant varieties & Farmers' Right Authority: Gazette Notification). It includes cereals: *Triticum aestivum*, *Oryza sativa*, *Zea mays*, *Sorghum bicolor*, *Pennisetum glaucum*, pulses: *Cicer arietinum*, *C. cajan*, *V. radiata*, *V. Mungo*, *Lens culinaris*, *P. sativum*, *Phaseolus vulgaris* notified in the first gazette notification; commercial crops: *Gossypium hirsutum*, *G. barbadense*, *G. arboreum*, *G. herbaceum* and *C. olitorius*, *C. capsularis* notified in the second gazette notification; *Saccharum*, *Zingiber officinale*, *C. longa* notified in the third gazette notification. In the fourth gazette notification, spices: *P. nigrum*, *E. cardamomum* and Oilseeds: *B. juncea*, *B. carinata*, *Brassica rapa*, *B. napus*, *Helianthus annus*, *Carthamus tinctorius*, *R. communis*, *S. indicum*, *Linum usitatissimum*, *Arachis hypogaea*, *Glycine max* had recently been notified for registration (PPV&FR Authority: Gazette Notification).

Registration of crops notified by in India and in some selected UPOV member states

Along with India, 12 UPOV members, namely Australia, Canada, Czech Republic, Estonia, EC, Lithuania, Latvia, New Zealand, Poland, Slovenia, Uruguay and the USA, were selected for the analysis of details of the crop varieties registered that were notified by PPV&FR Authority India. Out of the 13 above-mentioned members, only eight had developed online searchable databases (Table 4). The remaining five countries, namely Estonia, India, Lithuania, Latvia and Uruguay, had provided details of varieties registered in Word/Excel sheet format.

Comparative analysis of the data obtained on carrying out a search by the botanical name of crops notified in India in all the 13 countries gave the following results:

T. aestivum was the only crop notified in India that was notified for registration in all the 13 selected countries of the present study. *P. sativum* and *L. usitatissimum* were notified for registration in 11 and 9 countries, respectively. Other crops notified for registration in more than five countries (Fig. 1) were *Z. mays* (9), *B. napus* (8), *P. vulgaris* (8), *G. max* (7), *B. rapa* (5), *S. bicolor* (5) and *C. arietinum* (5).

The top five countries with the maximum number of registered varieties of crops that had also been notified in India are Community Plant Variety Right of EC (3267), the USA (2943), Canada (544), India (276) and Australia (264). *T. aestivum* (1858) was the crop for which maximum number of registration certificates had been issued (Fig. 2) in all the 13 selected countries of the present study. This was followed by *G. max* (1706), *Z. mays* (1661), *P. sativum* (569) and *B. napus* (536) with more than 500 registered varieties.

Up to March 2010, in Australia, the top three registered crops that were also notified in India were *T. aestivum* (91), *Saccharum* (72) and *G. hirsutum* (62). Similarly in Canada, *T. aestivum* (133), *P. sativum* (132) and *G. max* (187). The Czech Republic database search revealed that *T. aestivum* (61), *Helianthus annus* (59) and *P. sativum* (28) were the crops with the highest registration (Latvia: Latvian Catalogue of Plant Varieties, 2009). The highest Community Plant Variety Rights granted by EC were of *Z. mays* (1435), *T. aestivum* (514) and *B. napus* (402). In Latvia, *B. napus* (53) and *T. aestivum* (34) were the crops with highest registration (Latvia: Latvian Catalogue

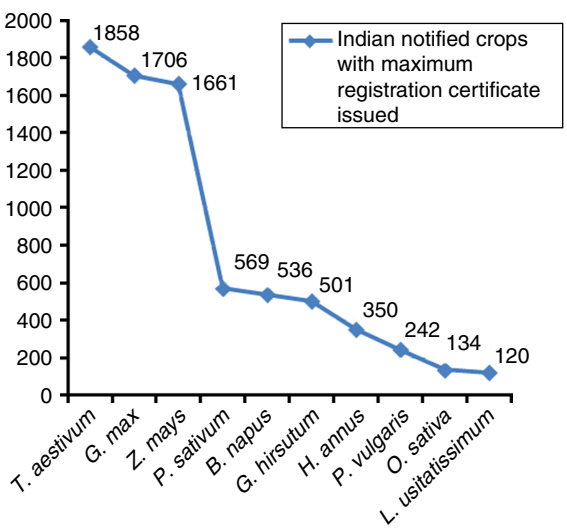

Fig. 2. Status of registration of Indian notified crop varieties (A colour version of this figure can be found online at journals.cambridge.org/pgr).

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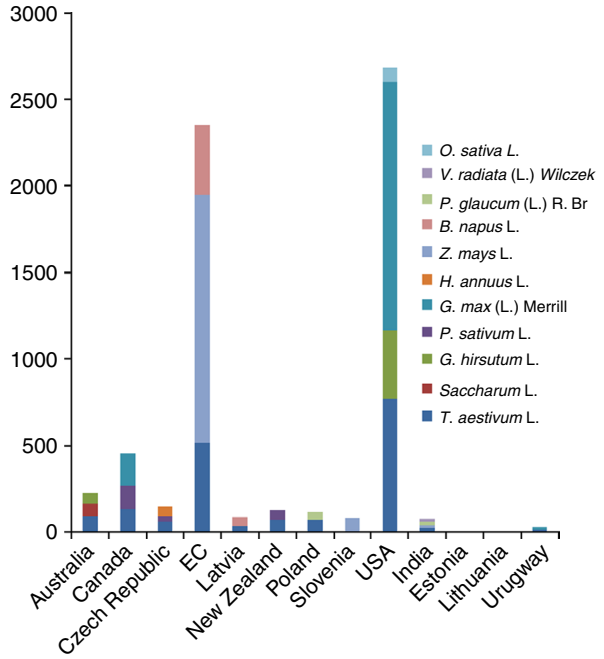

Fig. 3. Indian notified crop species with maximum registration in selected UPOV countries and India (A colour version of this figure can be found online at journals.cambridge.org/pgr).

of Plant Varieties, 2009). In New Zealand, *T. aestivum* (68) and *P. sativum* (60) were major registered crops. In Poland, *T. aestivum* (69) and *P. glaucum* (50) were the major registered crops. In Slovenia, *Z. mays* (80) hold the highest registration certificates granted by the PVP Authority. In the USA, *G. max* (1437), *T. aestivum* (772), *G. hirsutum* (392) and *O. sativa* (81) were the crops for which maximum scanned certificates had been issued by the PVP office. In India, *T. aestivum* (23), *Z. mays* (18), *P. glaucum* (17) and *V. radiata* (17) were the crops showing maximum registration with the PPV&FR Authority (India: Action taken on the applications, 2010). Although these registrations are mainly for the extant varieties, for which DUS testing has been relaxed in India since they had already been commercialized. In Estonia (Estonia: Protected plant varieties, February 12, 2010) and Lithuania (Lithuania: List of Plant Varieties Protected in the Republic of Lithuania), total number of registration (individual) of crops that are notified in India was below ten. In Uruguay, *G. max* (17) and *T. aestivum* (11) were the crops notified in India with maximum registration certificates (Uruguay: Registro de Propiedad de Cultivares – Solicitudes Instituto Nacional de Semillas) (Fig. 3).

Conclusions

UPOV convention had provided a uniform system for protection of plant varieties applicable in all member states. Most of the UPOV member states formulated their PVP laws in accordance with the UPOV Act to which they bind with some modifications in the provisions so as to make the laws applicable for their country. Protection to plant varieties in UPOV member states is granted in the form of either a patent or breeders' rights. By the provision of national treatment of UPOV Act 1991, the applicant variety of any member state would get the similar treatment both in respect of filing and grant of breeders' right as is given to the national of the home country where application of PVP was made. In comparison with the UPOV Act 1978, under the UPOV Act 1991, the genera or species to which the provisions of this convention would apply at the time of accession had extended from 6 to 15. Furthermore, the provisions of this convention would apply to all plant genera and species before the expiration of 10 years from the date of acceding to the Act 1991. Thus, the UPOV Act 1991 had extended the scope of protection. Before joining UPOV convention, the protection to plant varieties in EC was governed by Regulation no. 2100/94 that allowed the grant of CPVR for every registered variety. Since CPVR was a community right and was limited to countries of EC, thus after joining UPOV in 2005, the scope of protection had extended from EC to all the member states of UPOV convention.

At the same time, UPOV convention provided a very limited scope for farmers, so keeping this in view, India opted for *sui-generis* system to comply with TRIPs Agreement 1995 and formulated the PPV&FR Act in 2001. Farmers were granted a unique set of rights termed 'Farmers' Rights'. Traditional cultivated or wild relative of a variety about which there is common knowledge was allowed to be registered as farmers' variety. India had not joined the UPOV convention probably because these provisions in the PPV&FR Act 2001 would not comply with the UPOV convention.

T. aestivum was the only crop notified for registration in all the 13 selected countries, whereas *Z. mays*, *B. napus*, *P. vulgaris*, *G. max* and *B. rapa* were notified for registration in more than five countries. In future, India may join UPOV, but at present India is only an observer. The USA, Canada, India and Australia were the countries with maximum registration certificates issued by the concerned authority of the respective country. Thus, before filing an application for registration of new candidate variety, the database of the convention/authority (ies) of these countries must be searched to check the distinctness and novelty of the variety developed or to obtain information on whether the concerned country provides protection to the applicant variety. Furthermore, India would not be able to share any other DUS testing procedure undertaken in other countries for registration of its own varieties in India,

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which would be a very cost-intensive proposition at present. The crops for which UPOV test guidelines are not available, Indian expertise would be the only source of such procedure. As time progresses, a clear picture would emerge.

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