

The Procedure of Seed Potato Certification in Morocco

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Abstract

The potato (*Solanum tuberosum* L.) is a geophyte of the Solanaceae family and it represents the first crops in Morocco. Thanks to its high nutritional value, the seed requirements attain around 160000 T of which 70% originate from the previous production, which is the reason behind the limitation of the market's development. Considering the importance of the certified seeds, Morocco has signed a Program Contract to develop this sector. The production of certified potato seedling is a whole process that begins with the selection of plants and goes on until the marketing of the product where the producer should absolutely respect the cultivation processes and hygiene standards. The establishment and the insurance of compliance with these standards is carried out by the National Office of Sanitary Safety and Food Supplies (ONSSA). The purpose of the following work is to summarize and represent briefly the certification standards of potato seeds in Morocco.

Keywords: Seed, potato, ONSSA, certification, standards, Morocco.

Introduction

The seed is the first key element in plant production. The use of quality seed represents one of the investments with the highest multiplier effect of the entire agricultural economy. Beside the importance of seeds in crop production, the seed trade provides many jobs in rural areas where they generate significant revenues globally. The Global Seed Market was estimated at 42 billion USD in 2011 (ISF, 2011). This estimation attracted the attention of scientists and required scientific research, investment and the use of advanced technology in the field of seed production. Yet, experience shows that the seed industry is failing to develop satisfactorily due to the lack of appropriate legislation. Concerning the legal and economic globalization, the seed sector has, in the past years, had a multitude of legal rules with the aim of strengthening the food quality and safety through the harmonization of the national legislation on seed trade. A number of international organizations, conventions and treaties have been set up to deal with the regulation of the seed trade. Since the beginning of the 1970's, the seed sector in Morocco has known a sustained growth thanks to a juridical arsenal for the seed industry, which has been complemented by the promulgation in 1997 of Law 9-94 on the protection of plant varieties which entered into force on 28 October

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2002 (ONSSA, 2015). These national regulations are added to the global organizations of which Morocco is a member, such as the Organization for Economic Co-operation and Development (OECD), The International Seed Testing Association (ISTA), The International Union for the protection of New Varieties of Plants (UPOV), the International Seed Federation (ISF) and the UN Food and Agriculture Organization (FAO). These different international organizations constitute a regulatory framework that monitors the interests of all breeders, producers and consumers. The potato (*Solanum tuberosum* L.) is a geophyte of the Solanaceae family. Recently, it has become a leading product in the seed industry thanks to the cultural and culinary revolution that created the fast food chains. In Morocco, potato cultivation tops on the market garden with an area of 60 000 ha, accounting for 23% of the total area of vegetable crops and an annual output of 1.5 million tons with average yields between 17 and 18 T / Ha (Skiredj, 2007). Considering the high demand for potatoes, it is practically cultivated in all regions of Morocco with four types of cultivation, namely early cultivation; where planting occurs in September-December, seasonal cultivation in January -February, the culture of back-season in August and the culture of mountain in May (Chibane, 1999). The global seed demand is around 160 000 tons, including 20 000 tons for early-growing crops. 30% of these needs are covered by imports and 70% by common plants taken from previous productions. Given the importance of Seed Certification, Morocco signed a Program Contract in 2009 to develop the sector of certified potato seed production, which will cover 30% of certified seed needs in the near future (2020) instead of the current coverage that represents only 2% (AIISSI, 2014).

The following study aims to establish the certification process for potato seeds in Morocco by referring to the standards established by the National Office for Food Safety (ONSSA, 2015).

The Stages of Potato Seed Certification

The process of potato seed certification requires several stages and several generations of multiplication under tight control throughout the production chain (Figure 1).

The Selection of High-Performing Plants

This selection constitutes the first link of this chain, where we distinguish two techniques:

- I. Mass selection: this is the oldest empirical method. It consists of selecting the plants that appear to be the most interesting in a population and using their seeds as seeds for the next crop (Burg, 2004).
- II. Selection by hybridization: It consists in crossing two species or two varieties with each other, which gives plants new characteristics. This technique makes use of a long varietal selection (Bouharmont, 1995).
- III. Entry in the Official Catalogue
- IV. When a new variety is created, its breeder requests it to be registered in the official catalogue. It must be submit-

ted to the so-called DHS test: distinction, homogeneity and stability and, on the other hand, to the VAT test: agronomic and technological value which is based on the assessment of the agronomic and technological performance of the candidate variety in relation to the reference varieties that are already widely cultivated in the territory.

In order to officially register in the catalogue, there are three major steps to be followed: (I) The application for registration should be submitted by the breeder to ONSSA, this application has to be accompanied by samples of 300 kg of seedlings for varieties whose seed may be marketed in Morocco or abroad as well as 50 kg for varieties whose seeds may be propagated in Morocco for export, (II) A receipt for payment of the registration fee paid by the applicant to ONSSA, and (III) A Certificate signed by the breeder and / or the holder of the variety authorizing the filing of the application in the event that the applicant is not the breeder. After registration in the official catalog, the seed of the registered variety must undergo several generations of propagation before reaching the farmer.

Stages of Propagation

During this phase, the potato seed takes the following names:

- I. Starting plants: corresponding to the original material of the authentic variety, it must be free mainly from degenerative diseases (virus Y, virus X, virus A, ...) and quarantine pests and diseases in accordance with current phytosanitary legislation.
- II. Pre-base plants: seedlings that are usually multiplied from the original material; the number of field generations should not exceed four.
- III. Basic seedlings (Elite and Super Elite classes): the basic plants come from the multiplication of the pre-base or base plants, provided that the number of basic seedlings must not exceed four and that the number of cumulative pre-base and base generations does not exceed seven. The Super Elite (SE) class corresponds either to the harvest from pre-basic or basic plants, and the number of generation of pre-basic seedlings in the field and basic seedlings is limited to six. For the Elite class (E), the crop is either from pre-basic plants or from basic plants and the number of generations of pre-basic plants in the field and basic plants is limited to seven.
- IV. Certified plants (Classes A and B): certified plants are originated from the propagation of pre-basic or basic plants, and may also be produced from a first generation of certified plants. Depending on the level of quality compared to the standards, certified plants can be classified in class A or B.

In order to produce different categories of certified potato material, the multiplier must have the following: (1) an authentic genetic material free from disease and nematodes, (2) accessible land with a minimum area of 1/2 hectare (0.5 ha) for basic seedlings and one hectare (1 ha) for certified seedlings

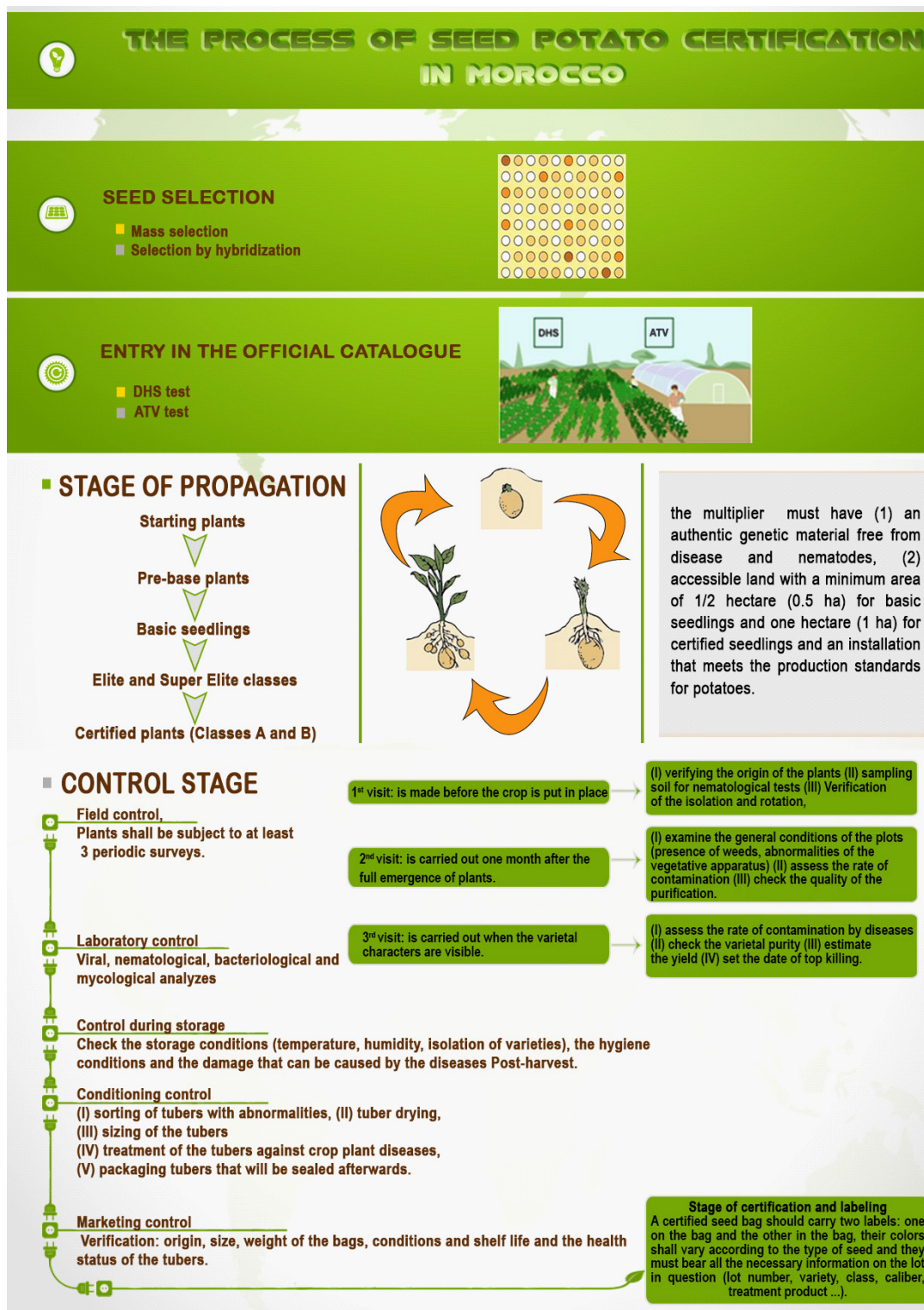


Figure 1. Schematic of seed potato certification as a propagation material.

Table 1. Standards for Minimum Insulation Distances.

Category	Prebase	Base SE and E	Certified A and B	Cultivation of solanaceous, cruciferous and stone fruit trees
Prebase	1 rang vide	20 m	40 m	500 m
Base SE and E	20 m	1 rang vide	20 m	300 m
Certified A and B	40 m	20 m	1 empty row	200 m

Table 2. Deadline for topkilling.

Categories	Classification by date of removal			
	At the deadline	During the first 15 days after the deadline	between 16 and 20 days after the deadline	More than 20 days after the deadline
Plants de Base				
- SE	SE	A	B	Refusal
- E	E	A	B	Refusal
Certified plants				
- A	A	A	B	Refusal
- B	B	B	B	Refusal

and an installation that meets the production standards for potatoes. The production declaration, 15 days after the installation of the production program, should be addressed to the certification body.

Taking in consideration the importance of control in the certified potato seed production scheme, the certification body exercises control at all stages, namely: Field control, laboratory control, control during storage, control during packaging and control to marketing. In order to do so, an application for inspection must be sent to the certification body, and should be accompanied by (I) receipt of the payment of the inspection fee, (II) a document that indicates the location of the parcels to be controlled (III) documents justifying the origin of the plants, (IV) analyses of the soil of the seed multiplication plots.

1. Field Control

This depends on the type of plant material. For the starting and pre-base material, the breeder or maintainer are the ones responsible for control, while the basic super Elite, Elite and A or B certified seedlings should be subject to at least 3 periodic surveys.

The first visit is made before the crop is put in place and consists of (I) verifying the origin of the plants by checking the labels of the invoices and delivery notes. (II) sampling soil for nematological tests in a representative pattern that takes into account the field's architecture, variability and ag-gregation of nematodes (for a surface area of 0.5 to 1 ha, sampling should be between 10 And 50 samples). (III) Verification of the isolation and rotation, the land for production must have at least a three years rotation for the pre-base and base plants and at least two years for the certified plants (Class A and B). Thus,

plots must respect the prescribed isolation distances (Table 1) in order to avoid the transmission of degenerative diseases (viral diseases). The second visit is carried out one month after the full lifting. The purpose of this visit is (I) to examine the general conditions of the plots (presence of weeds, abnormalities of the vegetative, apparatus: deformations, foliar discolorations, etc.), (II) To assess the rate of contamination by the pests via the diagnosis of 20 m² (5m * 4m) bands are chosen according to a well-defined sampling scheme that takes into consideration the size and geometric shape of the production plot (the minimum number of controlled bands is 5), (III) To check the quality of the purification by tearing off the feet of different appearance and not con-forming to the variety, feet suffering from diseases. The third visit is carried out when the varietal characters are visible, it allows (I) the assessment of the rate of contamination by viral, bacterial and plant fungal diseases, (II) the checking of the varietal purity based on the shape of the leaves, the color of the flowers, the coloration of the collar, the ribs and the hair of the leaves, etc., (III) The estimation of the yield using the formula: Yield = Stand Weight / Stand X Stand / Ha, (IV) set the date of top killing to be carried out within the timeframe set by ONSSA for seed types and climatic conditions (Table 2). Table 2 shows the standards set for top killing.

2. Laboratory Control

After harvest, tubers are examined in the laboratory; the main analyzes which are viral, nematological, bacteriological and mycological. The sample used for these tests should be presented with a minimum of 220 tubers for basic plants and 110 tubers for certified plants.

3. Control During Storage

Its purpose is to check the storage conditions (temperature, humidity, isolation of varieties), the hygiene conditions of the storage rooms and the damage that can be caused by the Post-harvest dis-eases.

4. Conditioning Control

During this phase, the tubers go through several stages, namely (I) sorting of tubers with abnormalities, (II) tuber drying, (III) sizing of the tubers depending on the type (round varieties 30-65 mm and 28-55 mm for oblong varieties, (IV) treatment of the tubers against crop plant diseases, (V) packaging tubers in new bags of 25 or 50 kg that will be sealed afterwards.

5. Marketing Control

The aim of this step is to verify and control the compliance with the packaging stages mentioned above: origin, size, weight of the bags, conditions and shelf life and the health status of the tubers.

Stage of certification and labeling: During this final stage, the certification body proceeds to the labeling and the sealing of the bags that respect the prescribed stages of production, preservation and packaging. A certified seed bag should carry two labels: one on the bag and the other in the bag, their colors shall vary according to the type of seed and they must bear all the necessary information on the lot in question (lot number, variety,

class, caliber, treatment product, etc.).

Conclusion

The seed potato certification is the culmination of a monitoring process that enables the official service (ONSSA) to ensure that the submitted seedlings meet the standards established by the inspection body. The use of certified seed is the most efficient means of spreading and disseminating genetic progress, since it ensures high productivity, adaptation to various biotic and abiotic stresses and quality that meets the market requirements.

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