

Potato plant growth technology

Potato plant growth

The potato has the following growth stages: sprout development, vegetative growth, tuber initiation, tuber bulking, and tuber maturation.

Seed generations

Africa RISING scientists often hear farmers using the terms G1, G2, G3, etc. for potato seed. Generally, G1 potatoes are of better quality than G2 ones, G2 better than G3 ones, and so on. But what does G actually mean? G stands for generation. G1 means generation one, which in Ethiopia means mini-tubers harvested from tissue culture derived in-vitro plantlets. The seed produced by planting G1 seed is referred to as G2 seed and so on. A more important factor than generations is using healthy seed for planting. As generations advance, the quality of seed decreases and it is, therefore, important to have developed a regular replenishment scheme.

Criteria for quality seed potato

Seed potato must originate from healthy parent stock and be free from disease, particularly bacterial wilt and viruses.

- Potato crop intended for seed should be harvested when sufficient seed-size potatoes are produced. It should be more than 80 days old at the time of harvest.
- Tubers for seed should not be damaged by pests or improper harvest and post-harvest handling. Damaged tubers are more susceptible to disease which in turn inhibits growth.
- Tuber size is not a criterion for healthy seed; however, it is best to use seeds of uniform size, weighing between 40–60 grams/tuber. Seeds of this size are large enough to provide the nutrients potato plants need during the early stages of growth, and reduce the seed requirement per hectare as compared to using larger sizes.
- Tuber skins should appear fresh and not wrinkled.
- A uniform sprout size of around 1–2 cm. Uniform sprouts will produce uniform growth, and make it easier to manage insect pests and diseases. Short green sprouts are preferred to long etiolated sprouts because the latter snap easily during packing, transportation and planting.
- Robust green sprouts with bluish-coloured bases are most preferred. Such sprouts can be obtained by storing seed potato on shelves in diffused light stores with three layers of tubers to allow in diffused light.

Growing conditions

Potatoes can grow well in areas with:

- At an elevation of more than 1,500 metres above sea level (the best elevation levels are over 2,000 metres);



- daily temperatures ranging from 10–22°C, with an average of 15°C;
- adequate water supply, (1,100 mm and above per annum);
- friable sandy soil containing organic matter; and
- soil free from bacterial wilt, nematodes and viruses.

Potato varieties

In Ethiopia, clones bred by the International Potato Center are generally introduced and selected under Ethiopia's conditions. Since 2005, more than 35 varieties have been released that are resistant to Late Blight, give high yields and taste good. However, many have lost their resistance to late blight and are no longer under production. Currently, the Belete, Gudene and Gorebella varieties are widely produced by farmers.

Field preparation

Preparing fields for potatoes requires heavy tillage, turning the soil over. Hoes, tractors or ploughs can be used for tilling to a depth of approximately 20–50 cm. Hoes are usually used when tilling the soil to a depth of 50 cm. This is done in two stages: the first is to a depth of 20 cm, and then the second is digging and turning the lower layer of soil over for a further 30 cm. While minimum tillage is a very good alternative, not much research has been done on this in Ethiopia.

Planting time

A good time to plant potatoes is after good shower of rain to make the soil moist, but not too wet. In Ethiopia, potatoes are generally planted in the first two weeks of June for the Meher (long) rainy season and in February or early March for the Belg (long) rainy season. If there is irrigation, it can be planted anytime, but frosty months should be avoided.

Planting and fertilizer application

Potatoes should be planted on the shoulders of ridges or on flat land, and organized in ridges after emergence. In any

case, potatoes should be planted in rows. If moisture is scarce, plant deeper. Plant tubers with their sprouts facing upwards. Apply organic fertilizer to their left and right. Potato farmers generally apply chemical fertilizers. The most commonly applied fertilizers were diammonium phosphate (DAP) and urea. However, recommendations have recently been made to apply NPS (although rates are not yet available), Urea and in some places also potassium. The current recommended rate is 200 Kg/ha of DAP and 150 Kg/ha of urea. All the DAP should be applied during planting, while the application of urea should be split. Half of the urea (75 kg) should be applied at first weeding (when the plant height reaches 10–15 cm) and the rest applied at flowering. Contact with between the tubers and fertilizers should be avoided during application. The recommended spacing for planting ware potatoes is 75 by 30 cm; a crop intended for seed may be planted at a lower spacing of 60 by 20 cm. Narrower spacing presents a challenge during hilling up, so farmers' convenience should be taken into consideration.

Hilling up and weeding

Weeding and hilling up are important practices for high potato yields and to reduce damage caused by insects. One can weed and hill up at the same time fertilizer is being applied. This should be done at least twice during a planting season: at four weeks after planting, and at six–eight weeks after planting. Hilling should be avoided when the canopy has closed.

Major potato diseases in Ethiopia and their control

Late blight is one of the most important potato diseases, damaging leaves, stems and tubers. This disease can wipe out a potato crop in a relatively short period of time. The cause of late blight is the fungus 'Phytophthora infestans' which is favoured by warm and moist conditions. The symptoms are small spots (pale to dark green colour) on leaves, and brown leaves when dry and black when moist. Late blight control: Use healthy seed; remove the sources

of infection; use resistant varieties; control for bacterial culture; use fungicides such mancozeb and ridomil. The recommendation rate of mancozeb is 1.5–2 kg /ha mixed with 760 litres of water; for ridomil it is 2.5–3 kg/ha mixed with 400–500 litres of water. The best control method is the use of integrated disease management, making chemicals the last resort. Farmers should protect themselves while spraying.

The bacterial wilt disease, caused by the bacterium *Ralstonia solanacearum*, is one of the most potato serious diseases. It develops fast under high temperature and high humidity conditions. The primary sources of the bacterium are: Infected seed, infested soil and contaminated water. The bacterium is disseminated from one field to another by contaminated soil, water, the shared use of farm tools and animals, and farmers. Wilting occurs on one or more stems while the leaves are still green, then the whole plant wilts and dies. Long sections of infected stems reveal dark brown to black streaking in the vascular tissue as the disease progresses. Brownish discolouration of the vascular ring could be seen in the cross-section of the tuber. Soil usually sticks to the eyes of infected tubers.

Bacterial wilt control: Use healthy seed; rotation with non-host crops; sanitation; destroy the remnants of infected plants; undertake minimum tillage; and use well-composted manure. For irrigated crops, use irrigation water that is not flowing through infected fields.

Acknowledgments

Africa RISING Ethiopia would like to thank the United States Agency for International Development (USAID) for the financial support provided to the project and to the local partners and farmers in the Amhara, Tigray, Oromia and Southern Nations, Nationalities, and People's regions for their active participation in the tree Lucerne action research activities. The contents are the responsibility of the producing organization and do not necessarily reflect the opinion of USAID or the US government.



ILRI thanks all donors that globally support its work through their contributions to the [CGIAR system](#)

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

Contact: Berga Lemaga (CIP)
africa-rising.net

