

# Main diseases affecting seed degeneration in Ecuador: new perspectives for seed production in the Andes

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## SUMMARY

Virus diseases, contrary to the general assumption, are not a constraint in the Andes. Surveys in Ecuador above 2800m, show that virus (PLRV, PVY, PVS and PVX) incidence is low in farmer's seed. However, the seed is highly contaminated with *Rhizoctonia solani* (AG 3) and damaged by the Andean Weevil (*Premnotrypes vorax*). A major breakthrough in seed quality improvement was achieved through tuber selection, which enables farmers to obtain a sustainable potato yield increase of 15%.



Figure 1. Harvest of the "on-farm" trials

## INTRODUCTION

Viruses are considered worldwide as the main cause of tuber-seed degeneration. In most countries, specific seed schemes have been established to improve tuber-seed quality through a reduction of virus incidence. However, Andean farmers have only a limited access to clean seed, as the amount produced by these formal systems covers less than 5% of the demand.

In Ecuador, farmers have low potato yields (av. 7 t/ha), assumed to be partially due to poor seed quality. To improve potato productivity, a joint project of the National Agricultural Research Institute (INIAP), the International Potato Center (CIP) and the Swiss Agency for Development and Cooperation (SDC), called FORTIPAPA was created in 1991. One of its aims was to establish a sustainable system of production and distribution of quality seed for small farmers.

On-farm trials carried out by FORTIPAPA in Chimborazo province quantified that INIAP's basic seed yielded only 17% more than farmer's seed (Merino *et al.*, 1996). The main factors affecting seed quality were not identified. Nevertheless, it was considered that viruses were the main cause of seed degeneration.

The objectives of this study were: i) to verify the impact of virus on seed quality, ii) to quantify their yield loss, and iii) to propose practices which would enable farmers to improve their own seed quality.

## MATERIAL AND METHODS

Reported results come from surveys of farmer's seed quality, from sample taken in FORTIPAPA's seed multiplication lots (ELISA of leaves at flowering) and from on-farm trials carried out between 1996 and 1998, in the provinces of Cotopaxi and Chimborazo (2800-3600m), Ecuador (Fig. 1).



Figure 3. Andean potato Weevil and tubers with damage

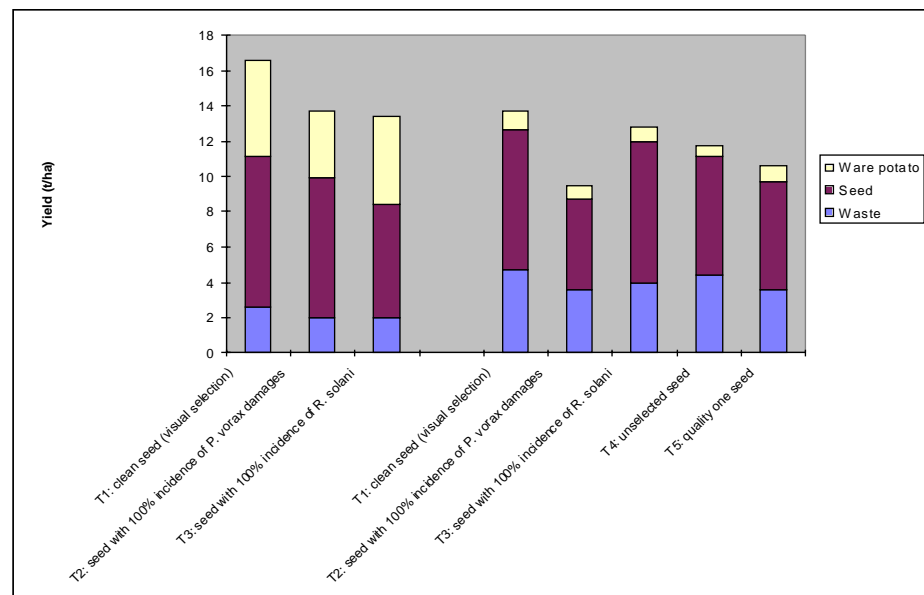


Figure 4. Influence of seed quality on yield (left 1996/97, right 97/98)



Figure 2. Advisor with plant showing Rhizoctonia symptoms

## RESULTS AND DISCUSSION

In Ecuador surveys above 2800m of farmers' field and seed multiplication lots, showed an astonishing low virus incidence (PLRV < 1%, PVY < 3%, PVS < 12% and PVX < 13%) (Fankhauser, 1996).

Similar results obtained by other scientists in several Andean countries suggest that the importance of viruses (PLRV and PVY) has been overemphasized in the tropical highlands of America (Egger, 1980, Bertschinger *et al.*, 1990, PROINPA, 1990).

In Ecuador, high incidence of *Rhizoctonia solani* (AG 3) (32%) (Fig. 2) and Andean Weevil damages (*Premnotrypes vorax*) (30%) (Fig. 3) were measured in farmer's seed. In 1997, during an average season, seed damaged by *P. vorax* or contaminated with *R. solani*, yielded 20% less (Fankhauser, 1997). However, in the season 1998, with the drought caused by "El Niño", *R. solani* did not affect yield in a significant way, while damages due to *P. vorax* caused a 30% yield loss (Fig. 4).

Farmers were trained to identify the symptoms of soil-borne pathogens and pests, affecting their seed. Through a simple visual selection (Fig. 5) of their seed (eliminating all diseased and damaged tubers) a 15% yield increase was obtained in 1998. Moreover this selected seed yielded 23% more than the seed produced by FORTIPAPA (Fig. 4).

Provided that an efficient extension system can be established, seed selection would be a cheap and easy way to achieve a sustainable potato yield increase in the informal seed system of the Sierra of Ecuador.



Figure 5. Selecting seed-tubers without visible damage

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