
Management of Potato Common Scab through Fertilizers

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Abd-ur-Rehman, K., Syed, R. A. G., Muhammad, S., Sayed, R. A. and Muhammad, A. (2015). Management of potato common scab through fertilizers. International Journal of Agricultural Technology 11(3):747-751.

Abstract Common scab of potato is most important disease of potato in all over the world. It reduces market and cosmetic values of potato due to presence of obnoxious scab lesions on skin of tubers. In present study we evaluated effect of fertilizer NPK with different concentrations on development of common scab of potato. Three concentrations of N (N₁= 100 kg, N₂= 125 kg, N₃ 75 kg), P (P₁= 75 kg, P₂= 100kg, P₃= 50kg) and K (K₁= 50kg, K₂= 75kg, K₃= 25kg) were used in experiment. These concentrations of fertilizers significantly reduced disease incidence. Maximum disease incidence (61%) was recorded in N₁ as it is in N₂ disease incidence was (54%) and in N₃ (42.2%). In case of P treatment P₂ showed minimum disease incidence (40.6%) as compared to P₁ (52%) and P₃ (45.6%). Maximum reduction of disease was observed in K₁ (44%) and minimum disease severity was observed in K₃ (40%). The experiment was laid out in (RCBD) randomized complete block design in research area of department of plant pathology, University of Agriculture Faisalabad.

Keywords: potato, common scab, fertilizer levels and NPK

Introduction

Potato (*Solanum Tuberosum*) is the most important crop in the world (Anonymous, 2008). Potato crop originated from the mountainous tracts of South America where it has been used as an important food crop since ancient time (FAO, 2005). In subcontinent the cultivation of potato started in 1900 (Malik, 1995). Potato has high nutritional value and it is a good source of carbohydrate, vitamins, minerals, and proteins. Potatoes consists of about 20 percent solid matters, 80 percent water and also contain minerals such as sulfur (s), magnesium (Mg), iron (Fe), phosphorus (P), potassium (K) and sodium (Na). It is eaten alone as vegetable as well as mixed with other vegetables, as snacks and the most popular of them being the finger chips (Bohmer *et al.*,

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2000). In Pakistan potato is an important crop for both consumers and farmers. It is forth most important crop by volume of production (FAO, 2010).

A number of biotic and abiotic factors effect potato crop. In a biotic factors high temperature, salinity, zinc deficiency is main constraints while in biotic factors many pests and different types of diseases such as black scurf, late blight, powdery scab and common scab are the most important (Heiko and John, 2010).

Different methods are used to control the disease. Mineral nutrients are routinely applied to boost crop yield and improve overall plant health and quality. The nutrition of plants largely determines their resistance to the disease. Mineral nutrients are frequently the first and foremost line of defense against plants disease (Datnof *et al.*, 2007). Plants have developed different types of resistance. Nutrient induced resistance was observed for NPK (Klikocka *et al.*, 2005). Balanced applications of nutrients suppress the growth of *S. scabies* and reduced the common scab disease of potato (Lambert *et al.*, 2005). Sulphar and magnesium fertilization increased tubers yield, improve quality and resist against *S. scabies* (Lambert *et al.*, 2005).

The aim of present study to identify the influence of fertilizer (NPK) on development of potato common scab.

Material and methods

Evaluation of NPK for common scab management

Different doses of fertilizers (N, P, and K) were applied to screen out their effect against common scab. Potato cultivars (Cardinal) was grown in rows and cultivation was done on 5th of October. At the time of sowing all fertilizers were applied. Phosphorus in form of triple superphosphate and Potash in form of murate of potash, Nitrogen in form of urea were applied in three replications. These fertilizers were tested at three different doses namely, recommended dose, (N_1 , P_1 , K_1), above then recommended (N_2 , P_2 , K_2) and below recommended dose (N_3 , P_3 , K_3) of each fertilizer (N_1 -100kg ha⁻¹, N_2 -125kg ha⁻¹, N_3 -75kg ha⁻¹, P_1 -75kg ha⁻¹, P_2 -100kg ha⁻¹, P_3 -50kg ha⁻¹, K_1 -50kg ha⁻¹, K_2 -75kg ha⁻¹, K_3 -25kg ha⁻¹) for an area of one hectare. The potato cultivar (Cardinal) was selected for study because it is highly susceptible to common scab disease. Sick field was prepared by application of bacterial suspension before 15 days of sowing. The plot without any fertilizer application (N_0 , P_0 , K_0) in each replication served as a control. Effect of fertilizers (NPK) on common scab incidence was recorded according to Bjer and Rower (1980).

N₀= Control
 N₁= 100kg ha⁻¹
 N₂= 125kg ha⁻¹
 N₃= 75 kg ha⁻¹

P₀= Control
 P₁= 75 kg ha⁻¹
 P₂= 100 kg ha⁻¹
 P₃= 50 kg ha⁻¹

K₀= Control
 K₁= 50 kg ha⁻¹
 K₂= 75 kg ha⁻¹
 K₃= 25 kg ha⁻¹

Results

Evaluation of nutrients (NPK) for development of common scab of potato

Three different doses of Nitrogen with one control (N₀- 0, N₁-100kg ha⁻¹, N₂-125kg ha⁻¹ and N₃-75 kg ha⁻¹) were applied in the field for testing their efficacy against common scab of potato. These three doses of nitrogen statistically decrease incidence of common scab disease of potato as compared to control. Maximum common scab severity (62%) was recorded in N₀ which was decreased in N₁, N₂ and N₃ respectively (49%, 39% and 25%) (Fig. I). All doses of nitrogen increased yield of potato.

In case of phosphorus treatments P₂ showed maximum reduction in diseases severity (24.40%) as compared to P₁ (35.2%), P₃ (52%) and control (Fig. II).

All the treatments of potassium significantly reduce the common scab disease of potato severity. Maximum reduction in disease severity was observed in treatment K₁ (44.33%) and minimum reduction in scab severity was observed in case of K₀ (68.6%) (Fig. III).

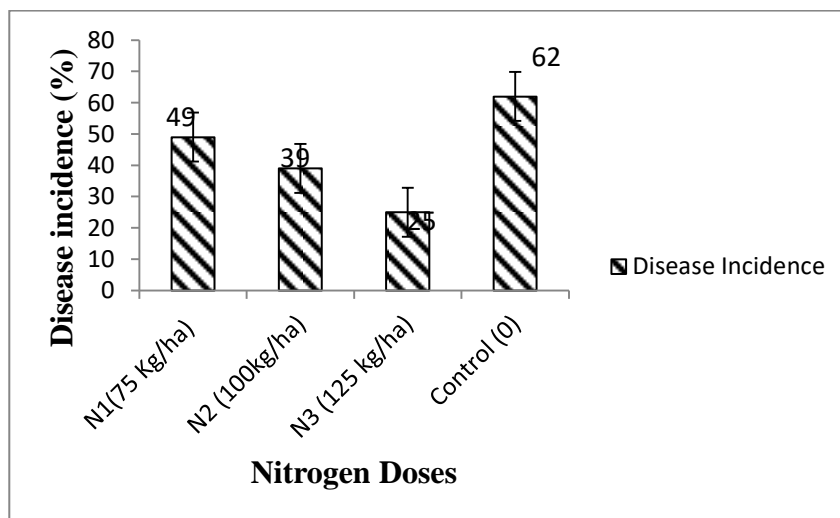


Figure 1. Effect of nitrogen on development of *S. scabies*

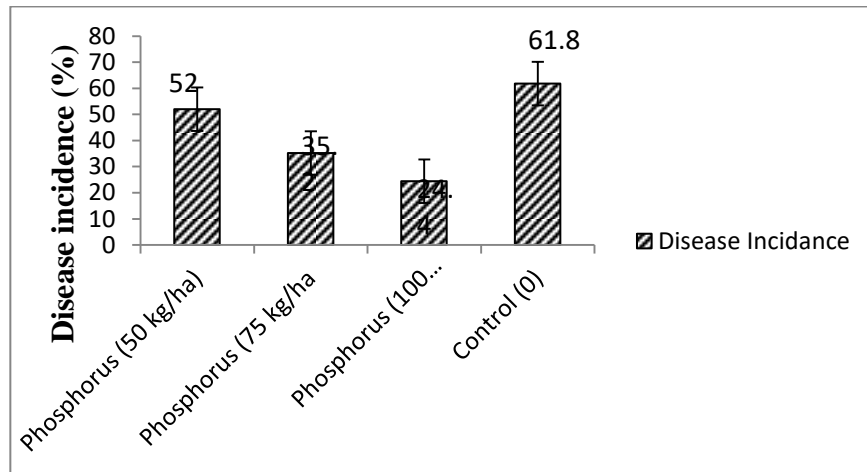


Figure 2. Effect of phosphorus on development *S. scabies*

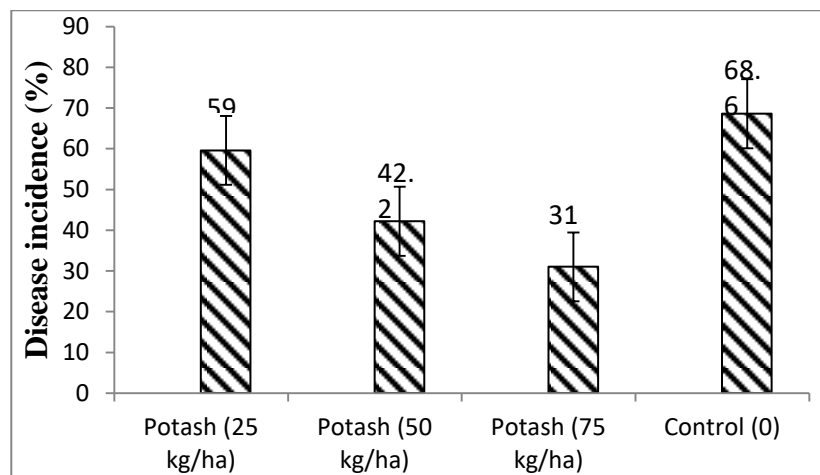


Figure 3. Effect of potash on development of *S. scabies*

Discussion

Mean infection rate of potato tubers reduced significantly by application of nutrients. NPK fertilizers were enriched with S and Mg and micronutrients. The analysis of research results confirmed a positive effect of NPK on tubers yield. Results of present study match with, Grocholl and Scheid (2002) who studied that elemental sulphur reduces the growth of *Streptomyces scabies* because sulphur decrease soil pH and enhance tubers resistance to this pathogen. Common scab pathogen severs in soils of pH 5.5-8.0 in more acidic soil growth of *Streptomyces scabies* reduced (Fotyma and Zeiba, 1988). Result of present study also resemble with Grzebisz and Hardter 2006 who was reported that due

to balanced application of NPK common scab infection will reduced and pathogen will be suppressed. Other important element in fertilizers was Mg whose availability in soil increase acidity and moisture level, high moisture levels and acidic soil reduce *S. scabies* growth (Keinath and Loria, 1991).

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(Received: 8 January 2014, accepted: 26 February 2015)