

# Role of reproducible research tools in quantifying *Sclerotinia* disease prevalence survey

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During the Southern African Society for Plant Pathology's virtual conference this year, Dr Lisa Rothman delivered an overview of data collected from a ten-year *Sclerotinia sclerotiorum* (*S. sclerotiorum*) survey conducted by the Crop Estimates Committee (CEC). Although the research summarised the national survey, the focus was on the role of reproducible research in plant pathology.

The adoption of R (R Core Team, 2021) and Rstudio (R Studio Team, 2021) platforms for statistical programming, as well as Git and GitHub (©GitHub, Inc, 2021) to manage data and statistical workflow, was encouraged by providing an example in a real-world scenario.

*S. sclerotiorum*, a polyphagous fungal pathogen, causes diseases such as *Sclerotinia* stem and head rot of soya bean and sunflower, respectively. The study aimed at summarising the *Sclerotinia* disease intensity across soya bean and sunflower production regions in South Africa, based on data collected over a ten-year period.

## Producers contribute to research

The CEC conducted a national *Sclerotinia* disease survey from 2006 to 2015, to which 285 soya bean and 324 sunflower producers responded. A total of 1 331 completed surveys were included in the study, representing 87 towns.

*Sclerotinia* disease intensity was assigned as a percentage of the producer's perceived area (hectares) affected by the disease. The responses at farm level were categorised into binary values, classified as healthy (0) or diseased (1) to calculate *Sclerotinia* prevalence, or the percentage of disease responses relative to the total responses. Binary disease responses were mapped per annum for each crop (Figure 1).

The survey area and the extent to which these were representative of the population was determined by assessing total provincial area planted per annum, relative to the reported *Sclerotinia* survey provincial area planted per annum. This was mapped for each crop during the survey. The responses reflected prominent production regions (Free State, KwaZulu-Natal, Mpumalanga, and North West. ).

The survey represented between 1,3 and 16,7% of the area planted to soya bean, while sunflower representation ranged from 0,4 to 94,3%. A 100% *Sclerotinia* prevalence in soya bean and sunflower was observed across multiple years, although the lowest prevalence of 15,2 and 3,2% was recorded in 2015 (n=112) and 2013 (n=95) for soya bean and sunflower, respectively.

The North West (n=57) and Limpopo (n=49) had the lowest mean prevalence of 7 and 10,2% in soya bean and sunflower, respectively, whereas the highest mean prevalence of 55,7 and 100% in

soya bean and sunflower, respectively, was reported in Mpumalanga (n=244) and the Northern Province (n=3).

## Weather affects disease intensity

The association between mean January, February and March weather parameters as well as disease intensity and prevalence was investigated through correlation analysis, to determine parameters potentially responsible for variation observed. A negative association between *Sclerotinia* and maximum and minimum temperature, as well as a positive association between precipitation and relative humidity was reported.

The relationship between the previous crop planted, maize/soya bean/sunflower, and *Sclerotinia* intensity was explored through conducting a Mann-Whitney U test (n=379). There was no significant reduction in *Sclerotinia* disease where maize had been planted the previous year for either crops.

This survey renders a historic overview of *Sclerotinia* and indicates the extent of *Sclerotinia* diseases in South Africa, emphasising the need for future research. The sporadic nature of this pathogen, the current epidemics observed, and potential spread to canola in the Western Cape further underpin the need to understand the underlying processes driving epidemic development. 🌍

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Figure 1: Binary *Sclerotinia* disease responses for each crop mapped per annum.

