KWAZULU-NATAL PROVINCE
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

Research & Technology
BULLETIN
2021/22-03

Effect of fungicides on the yield of dry bean cultivars

Thembinkosi Ntombela and James Arathoon

Introduction

The humid conditions experienced in the high rainfall areas of KwaZulu-Natal are ideal for the development of leaf fungal diseases, such as rust (Figure 1), ascochyta and angular leaf spot, in dry beans. Therefore, cultivars with good tolerance to these fungal diseases should be grown in those areas where disease risk is high.

FIGURE 1a: Healthy dry bean plants

FIGURE 1b: Rust infected plants.

Evaluations are conducted annually on the Cedara Research Station to determine the adaptability and yield of dry bean cultivars when grown with and without the application of fungicides. Three small white (SW) dry bean cultivars and thirteen red-speckled sugar-bean cultivars were evaluated during the 2015/16, 2016/17, 2017/18 and 2018/19 growing seasons. The cultivars were hand-planted into a Hutton soil at a seeding rate of 180 000 seeds ha^{-1} in rows spaced 0.75 m apart. Fertilizer was applied according to recommendations for 3 t ha^{-1} yields. The fungicides, difenaconazole, carbendazim/flusilazole and mancozeb, were alternated and applied fortnightly from early flowering until just before physiological maturity. Weeds and insects were chemically controlled throughout the growing-season. The crops were grown under dry-land conditions.

Results and discussion

Mean yields of 1.90 t ha^{-1}, 3.83 t ha^{-1}, 3.35 t ha^{-1} and 4.21 t ha^{-1} were produced in the 2015/16, 2016/17, 2017/18 and 2018/19 growing seasons, respectively. The differences in mean yield between the sprayed and unsprayed treatments were 0.48 t ha^{-1}, 0.97 t ha^{-1}, 0.98 t ha^{-1} and 0.96 t ha^{-1} in the respective growing seasons. Overall, the application of fungicides resulted in a 32.5% increase in yield (Table 1).

The three small-white cultivars and the red-speckled sugar bean cultivars, PAN 9292, Kamiesberg, Tygerberg and PAN 9216 are tolerant to angular leaf spot and rust. Despite being considered tolerant to these diseases, these cultivars produced considerably higher yields when fungicides were applied.

TABLE 1: Mean yield of the sixteen cultivars when sprayed and not sprayed with fungicides for the four growing-seasons combined and the yield increase as a result of spraying with fungicides

Cultivar	Fungicides	No fungicides	Yield increase
	(t ha^{-1})		(%)
Teebus RR1 (SW)	3.65	3.32	9.9
PAN 9292	3.74	3.36	11.3
PAN 123 (SW)	4.02	3.54	13.5
SW 1 (SW)	4.04	3.54	14.2
PAN 9216	3.33	2.85	17.1
TYGERBERG	3.71	2.94	26.2
KAMIESBERG	3.80	2.99	27.0
WERNA	3.57	2.81	27.1
RS 7	3.52	2.63	33.6
DBS 310	3.25	2.35	38.6
RS 5	3.54	2.48	42.5
RS 6	3.63	2.50	45.3
OPS-RS4	3.44	2.26	52.2
KRANSKOP HR1	3.12	1.91	63.3
KRANSKOP	3.48	1.98	75.2
PAN 148	3.57	1.95	83.4
Mean	**3.59**	**2.71**	**32.5**

^ SW = small white cultivar. # = the percentage increase in yield resulting from applying fungicides.

If it is assumed that the price of red-speckled sugar beans is R12 500 ton^{-1} and that the cost of applying the fungicide applications, excluding fuel, machinery and labour costs, is approximately R1300 ha^{-1}, then a yield increase of 0.10 t ha^{-1} is required to cover the cost of the fungicides. All the cultivars had considerably greater increases in yield than 0.10 t ha^{-1} when fungicides were applied.

Recommendations

It is recommended that the three small white cultivars, and the sugar-bean cultivars, PAN 9292, PAN 9216, Tygerberg, Kamiesberg, be grown in the high rainfall areas of KwaZulu-Natal, especially if no fungicides are applied. However, to optimize yield and economic return, it is advised that suitable fungicides be applied fortnightly from early flowering to all dry bean cultivars.

Further Reading

Fourie, D. 2019. 2019/2020 Dry Bean Cultivar Recommendations. ARC-Grain Crops, Potchefstroom. 2019-2020

KwaZulu-Natal Enterprise Budgets – Field Crops (COMBUDS). Economics, Marketing and Value Adding (EM&VA) Directorate, KwaZulu-Natal Department of Agriculture and Rural Development.

Contact

Mr Thembinkosi Ntombela
Scientific Research Technician
Tel: (033) 343 8251
E-mail: thembinkosi.ntombela@kzndard.gov.za

Mr James Arathoon
Control Scientific Technician
Tel: (033) 3559495
E-mail: james.arathoon@kzndard.gov.za

KZN Department of Agriculture & Rural Development
Directorate: Agricultural Crop Research Services
Sub-directorate: Crop Scientific Research Services
Division: Agronomy
Cedara Research Station

Published August 2021