



VI22157: Modelling Gold3/Bounty71 Rootstock Flower Budrot Losses and Financial Implications - A Case Study

Aim:

The aim of this work was to model the impact of flower budrot for Gold3 grown on Bounty71 rootstock (Gold3-Bounty), compared with Gold3 grown on Bruno rootstock (Gold3-Bruno) to determine the effects on productivity and Orchard Gate Return (OGR).

Methods:

This project builds upon earlier work relating to Gold3 flower budrot which was reported in project 'VI20098 - Gold3 Bud Abortion'. The previous two-year innovation trial reported flower budrot incidence level in two commercial orchards and one research orchard in the Bay of Plenty over two flowering seasons (2019 and 2020). Two sites had Gold3 on Bounty71 rootstock (Gold3-Bounty) and Gold3 on Bruno rootstock (Gold3-Bruno), and one site only had Gold3 on Bounty71 rootstock. All three sites had a history of Psa flower budrot and were growing in similar conditions, with comparable management. The trial had collected data from 15 vines from each site, with 100 flower-buds per vine assessed for budrot. The level of budrot reported varied widely (between 5-80%) across sites and seasons, with these variations attributed to differences in seasonal weather conditions, Psa inoculum availability, and Psa management practices.

The work also showed flower bud loss was more likely to occur and to a greater degree, on Gold3Bounty (up to 35% flower bud loss), in comparison with Gold3-Bruno (less than 1% flower bud loss). Levels of budrot incidence varied between the two flowering seasons.

Utilising data from the research report, three Gold3-Bounty scenarios were developed and compared with the Gold3-Bruno results.

- Gold3-Bounty71 Worst scenario (highest level of budrot = 35% budrot)
- Gold3-Bounty71 Moderate scenario (intermediate level of budrot = 9% budrot)
- Gold3-Bounty71 Least scenario (lowest level of budrot = 2% budrot)
- Gold3-Bruno = less than 1% budrot

All these scenarios were incorporated into a financial model to simulate the potential financial impacts of flower budrot on production and OGR (the return paid to growers net of post-harvest costs).

Estimation of production outcomes

Production assumptions are reported in Table 1. The scenarios track productivity from flower buds per square metre through to Class 1 trays per hectare, applying assumptions about losses due to Psa flower budrot, flower bud thinning, losses between pre-flower and fruitset, and losses between fruitset and harvest. The average fruit weight and therefore count size, Taste Zespri Grade and number of Class 1 trays/ha were affected by each of the modelled assumptions for percentage flower budrot. (Assumptions were informed by information provided by growers experienced in growing Gold3 on both Bounty 71 and Bruno rootstocks).

Estimation of financial outcomes

Modelled OGR results are reported in Table 2. The model used 2021 OGR values in the calculation of financial implications for the different flower budrot scenarios. The Zespri Annual Report 2020/21 and Zespri 2021 Grower Payments details were referenced to model costs and returns. Results are reported as OGR net of additional flower bud thinning costs as Gold3-Bounty can have much higher costs which result in significant cost differences between scenarios.

Table 1: Scenario production assumptions

		Bounty71		
2021	Bruno	Worst	Moderate	Least
Class 1 te/ha	15,373	11,476	16,029	16,546
Taste Zespri Grade TZG	0.64	0.64	0.69	0.70
Average Count Size	27.76	27.76	26.25	26.06
Average Fruit Weight g	136	136	138	139
Class 1 %	85.60	85.60	85.60	85.60
Gross te/ha	17,959	13,406	18,725	19,330
Gross fruit/ha	498,535	372,160	491,540	503,677
Gross fruit/m ² at harvest	49.85	37.22	49.15	50.37
Fruit/m ² post flower	53.84	40.19	53.09	54.40
Flowers/m ² post flower bud thin	59.77	47.29	58.93	60.38
- % budrot	0.40	35.00	9.00	2.00
- % flower bud thinning	11.28	0.00	10.00	14.00
Flowers/m ² pre flower bud thin	67.67	72.75	72.75	72.75

Table 2: Modelled OGR results based on the four scenarios

Scenario		Bounty71		
	Bruno	worst	moderate	least
OGR \$/ha	177,124	132,224	187,900	207,883
Additional thinning cost saved/ <i>incurred</i>		5500	<i>3500</i>	<i>6500</i>
Net OGR \$/ha	177,124	137,724	184,400	201,383



The model outcomes:

In this case study, the OGR for the Gold3-Bruno scenario is estimated to be \$177,124/ha. This figure incorporates the reduced flower bud thinning cost associated with lesser floralness of Gold on Bruno vs Bounty rootstock.

For the Gold3-Bounty block worst affected by Psa flower budrot, the OGR is predicted at \$137,724/ha.

The OGR for the Gold3-Bounty71 block moderately affected, or least affected by Psa budrot, were predicted to achieve \$184,400/ha or \$201,383/ha, respectively, net of flower bud thinning costs.

Conclusions:

In this case study, the “moderate” and “least” Gold3-Bounty71 budrot scenarios showed better OGR returns than Gold3-Bruno.

Though based on only two commercial Bay of Plenty orchards, this suggests that improved returns for Gold3-Bounty versus Gold3-Bruno can be considered realistic and achievable as long as Psa is well managed.

The OGR returns for the “worst” Gold3-Bounty scenario in this study fell well below the Gold3-Bruno result highlighting the impacts Psa can have when not well managed.

When considering growing Gold3 on Bounty rootstock it is important to evaluate the Psa risk profile of the site as well as the soil type. While Gold3-Bounty confers a host of benefits in growing areas where soil conditions are challenging and is still the best rootstock in heavy wet soils, there is also a genuine higher susceptibility to Psa-related budrot which can impact both production and financial returns.