



## Evaluation of on farm Demonstration of Dual gold (pre-emergence) and Gallant Super (post-emergence) herbicides for the Control of Weeds in Faba bean in the Highlands of Bale, Southeastern Ethiopia

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**Abstract:** The demonstration was conducted in two districts of Bale zone, Goba and Dinsho to demonstrate and validate the effectiveness of pre emergence (Dual gold) and post emergence (Gallant super) herbicides laid out in simple plot design. Faba bean variety 'Moti' was used with recommended seed rate of 180 kg ha<sup>-1</sup>. 100 kg ha<sup>-1</sup>NPS fertilizer was applied all at planting. Important yield and yield components, percentage of yield increment and loss, production and benefit cost were collected to see the profitability difference of the herbicides. The grain yield of dual gold was higher than the gallant super and unsprayed and the percent benefit (%NB) also showed that dual gold and gallant super were beneficial. However, the application of dual gold was superior rewarding treatment. The guidelines on the utilization of the herbicides should be supported by practical training and following the safety and precautions of the manuals prepared with herbicides.

**Key words:** Demonstration, Pre emergence herbicides, post emergence herbicides, dual gold, gallant super, profitability

### Introduction:

Faba bean (*Vicia faba* L.) is one of the most important pulse crops worldwide. Since, it is used as nitrogen fixing plant; capable of returning atmospheric nitrogen into soil and a source of high quality protein (Amin, 1988). It is one of the greatest production areas among major pulse crops grown in Ethiopia (CSA, 2012). However, its productivity is very low compared to its potential productivity which is 1.3 ton per hectare as compared to world average 1.8 ton per hectare (FAOSTAT, 2010). The yield and productivity of faba bean is influenced by various production constraints such as biotic and abiotic factors. Weeds are a challenging problem to pulse crop in general and to faba bean production in particular. Since, the crop is poor competitive to both broadleaf and grass weed species from early establishment to the flowering stage (Getachew and Rezene, 2006) that it requires control measures at this critical period. Weeds affect growth, yield and quality of crop plants adversely and reduce soil fertility, compete with the crop plants for soil moisture, available nutrients, space and sunlight etc. leads to the low yield of crop.

Weeds can be controlled by different methods such as manual, mechanical, and chemical methods. Generally, for the weed management, farmers do manual weeding, but manual weed management is always laborious, expensive, time consuming, uneconomical and needs to be often repeated at different intervals, as compared to chemical weed management. Weed management with herbicides is an effective, quick in action, and time saving (Ahmed *et al.*, 2005). Bale highland was a wheat belt area where many alternative choices of herbicides to control weeds and mechanization for postharvest handling of the cereal crops were available. However; hand weeding is the only option to control weeds from faba bean fields due to unavailability of pre and/or post-emergence herbicides to control weeds in the area. But, dual-gold 960 E.C is one of the pre-emergence herbicide which is available to kill both grassy and broadleaf weeds at the early and later stage of the crop growth to reduce yield loss and gallant super is the post emergence herbicide which is available to kill annual and perennial grass weeds in broad leaf crops at any time.

However, demonstration and importance of this herbicide on farmers' field is not done widely in order to popularize and promote the technology in the area.

### **Objectives:**

- To demonstrate and validate the effectiveness of herbicides (Dual gold and Gallant super) against faba bean weed
- To create awareness for end users on the effectiveness of verified herbicides for the management of weed on faba bean
- To evaluate economic profitability of the technologies

### **Materials and Methods:**

#### **Treatments and Experimental design:**

The demonstration was conducted in Goba and Dinsho districts at 4 kebeles (2 kebeles/ district. Kebeles were considered as replication, i.e. the demonstration was replicated on two kebeles per district. Each demonstration field has three plots i.e. Dual gold sprayed, Gallant super sprayed and unsprayed plots laid out in simple plot design on 5 x5m plots area. 1.5 litres per hectare of pre-emergence herbicide (Dual gold 960 EC) with 200 litres per hectare of water was used at third date of planting as per the recommendation of the chemical for controlling broad and grassy weeds before the crop was emerged. The post emergence (gallant super) was used for controlling grassy weeds when target grass weeds are actively growing at the 2-6 leaf stage at the rate of 1 litre per hectare using 200 litres per hectare water. 'Moti' faba bean variety was planted in the main cropping season for the demonstration. The recommended seed rate 180 kg per hectare and 100 kg per hectare NPS fertilizer were uniformly supplied for each treatment at planting. However, the demonstration conducted in Dinsho district from one kebele was not performed well due to water logging problem. The treatment is to show the effectiveness and effect of herbicides on overall yield of sprayed and unsprayed plots. No hand weeding was applied to see the effectiveness of the herbicides. Farmers, DAs, and researchers were participated on the demonstration.

#### **Data collected and Analysis:**

Important yield and yield components, percentage of yield increment and loss, production cost and benefit were collected to see the profitability difference of the treatments. Yield from the experimental plot was adjusted downward by 10% to reflect the difference between the experimental yield and yield farmers could expect from the same treatment. Accordingly, the mean grain yield of herbicides and unsprayed plots were subjected to a discrete economic analysis using the procedure recommended by CIMMYT (1988). To estimate economic parameters, faba bean yield was valued at average open market price of 13birr kg<sup>-1</sup>, 1000 birr litre<sup>-1</sup> dual gold and 800 birr litre<sup>-1</sup> of gallant super were set during planting time and labor was valued at 35 birr per person per day and used for the determination of the variable cost.

The agronomic data were analyzed using GENSTAT computer software and descriptive statistical techniques such as percentage. Economic analysis was made using partial budget to determine the economic feasibility of the herbicides.

**Results and Discussion:**

The result of the demonstration showed that from two districts of three kebeles an average of 1796, 1447 and 1200 kg ha<sup>-1</sup> of grain yield was harvested from dual gold, gallant super and unsprayed plots, respectively. This can show us an average pre emergence (dual gold) herbicide from demonstration in the district had an increment of yield by 50% whereas; an average 21% was obtained from the post emergence herbicide (gallant super).

The grain yield of the dual gold treatment was higher than the unsprayed and gallant super treatments in all demonstrated kebeles of the districts which could be due to the contribution of the herbicide that considerably effective in weed reduction, particularly at the early establishment of the crop that significantly reduces the competition.

**Table 1. Yield, yield increment and loss of the demonstration:**

Districts	Kebeles	Practices	Yield (kg ha <sup>-1</sup> )	Yield increment (%)	Yield loss (%)
Dinsho	Abakara	Dual gold	1350	50	33.3
		Gallant super	1100	22.2	18.2
		Unsprayed	900		
Goba	Sinja	Dual gold	1840	95.7	49
		Gallant super	1240	32	24.2
		Unsprayed	940		
Goba	Alloshe	Dual gold	2200	25	20
		Gallant super	2000	13.6	12
		Unsprayed	1760		



**Unsprayed plot**



**Dual gold sprayed plot**

On the other hand, the one way analysis of variance with no blocking showed significant (P < 0.05) differences for plant height, pods per plant and grain yield among dual gold, gallant super and unsprayed. Application of pre emergence herbicide (dual gold) was best in producing higher pods per plant and grain yield as shown in table 2.

**Table 2. Main effect of herbicides sprayed and unsprayed:**

Plant height (m)	Tiller per plant	Pods per plant	Seeds per	Yield (kg ha <sup>-1</sup> )
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				plant	
Dual gold	147.0 <sup>a</sup>	0.3	15.8 <sup>a</sup>	36.1	1797 <sup>a</sup>
Gallant super	137.7 <sup>c</sup>	4	12.6 <sup>b</sup>	28.9	1447 <sup>b</sup>
Unsprayed	140.4 <sup>b</sup>	0.3	11.2 <sup>b</sup>	23.4	1167 <sup>b</sup>
LSD <sub>0.05</sub>	1.792	Ns	2.6	ns	320
CV (%)	8.6	175.5	21.6	22.8	26.4

### Partial budget and marginal analysis of herbicides and hand weeding:

The analysis conducted was expressed in hectare as shown in the following table 3. The dominated treatments according to the dominance analysis were eliminated from further economic analysis. To identify treatments with the optimum return to the farmer's investment, marginal analysis was performed on non-dominated treatments. In the districts, faba bean yield of the dual gold and gallant super treatment were better than unsprayed. Application of Dual gold (8.3% NB) and Gallant super (7.3%NB) were beneficial (Table 3). However, application of Dual gold is superior rewarding treatment.

**Table 3. Partial budget and marginal analysis of herbicides and unsprayed:**

	Dual gold	Gallant super	Unsprayed (control)
Field yield (kg ha <sup>-1</sup> )	1796.7	1461.3	1166.7
Adjusted yield (kg ha <sup>-1</sup> )	1617	1315.2	1050
Gross field benefit (kg ha <sup>-1</sup> )	21021	17097.6	13650
Total costs that vary (Birr ha <sup>-1</sup> )	2260	2060	6060
Net benefit (Birr ha <sup>-1</sup> )	18761	15037.6	7590
% Benefit (Net benefit/TC that vary)	8.3	7.3	1.25

### Summary and Recommendations:

Demonstration was carried out to evaluate the effectiveness of the herbicides as the herbicides were not well known in the area in pulse crops. Both dual gold and gallant super herbicides were effective in controlling weeds in faba bean. From the yield analysis the grain yield of dual gold and gallant super were better than unsprayed. The net benefit from Dual gold and Gallant super herbicides were higher and beneficial. However, application of dual gold was superior rewarding treatment. Therefore, farmers of the area can use both herbicides to control weeds in the farm of faba bean alternatively depending on the availability of the herbicides but to obtain high yield dual gold is better. The safety on the utilization and guidelines of the herbicides should be supported by practical training.

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