BIBLIOGRAPHY

NGAWIT DENVER N. APRIL 2012. Growth and Yield of Four Varieties of Bush Snap Beans (*Phaseolus vulgaris* L) Inoculated with BSU Indigenous Microbial Organisms (IMO) under La Trinidad, Benguet condition. Benguet State University.

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ABSTRACT

The study was conducted to determine the growth and yield of the different varieties of bush snap beans; determine the effect of Benguet State University indigenous microbial organisms (IMO) inoculation on the bush snap bean varieties; determine the interaction effect of BSU-IMO inoculation and the different bush bean varieties; and determine the profitability of using BSU indigenous microbial organisms (IMO) inoculation in bush snap bean production under La Trinidad, Benguet condition.

The inoculation of BSU-IMO did not significantly increase the growth and yield of the bush bean varieties. In most of the parameters gathered, no significant differences were recorded as an effect of the variety except for pod length. The non-application of BSU-IMO for bush bean production is more profitable.

INTRODUCTION

Bush bean (*Phaseolus vulgaris*) is a bushy and determinate crop, and is commercially grown in the highlands of the Cordillera. It is considered as one of the leading farm crops in Benguet and Mountain Province, grown for its economic value and also for its nutrients as it is an important source of fibers, riboflavin and niacin as well as some phosphorous, calcium and iron (Loakan, 2003).

Bush beans, being a legume have the ability to fix nitrogen from the atmosphere through the action of nitrogen-fixing bacteria present in its roots known as *Rhizobium*. This ability of legumes gives them the advantage over any other crops for enabling to supply themselves partially with nitrogen and helps in the maintenance of soil fertility level.

For profitable production, the introduction of high yielding varieties is of great importance for successful production. Another practice is the enhancement of the nitrogen fixing capability of the crop through inoculation. New varieties as well as modern cultural practices such as effective inoculation are more scientific approaches towards a greater and successful production.

Inoculation is known to have an important role in legume production. Inoculation or introducing proper strain of bacteria to legume seeds intended for planting by adding Rhizobium will create the legume to secure nitrogen from the air (Pog-ok, 2001).

Mass destruction of beneficial microorganisms in the soil is brought by man's excessive use of chemicals and inorganic fertilizer in farming, mostly in every cropping. Moreover, intensified cultivation requiring continuous and excessive application of those inputs makes the soil acidic and causes deterioration of natural ecosystem. Consequently, this results to irreversible decline in productivity with time per unit area even with increasing farm inputs.

Several factors have been mentioned to cause low quality and yield. One of these factors is the leaching and mineralization of soil nutrients due to excessive use of agricultural chemicals. Some of the beneficial microorganisms are also becoming eliminated due to over application of chemical fertilizers and pesticides which make the soil unfavorable for both the soil microorganism and the crop.

Due to the increasing population and with the economic crisis and changing climate, there is a need to increase the production through the use of good varieties and appropriate cultural management of crops.

Using good and new varieties for local farmers may be the solution of the low-yielding problem that had been observed and reported. Thus, evaluating different bean varieties is essential in identifying the best variety for a given location.

On the other hand, legume inoculants play an important role in leguminous crops as they prevent early nitrogen starvation, increase the chance of the young plants to nodulate and enrich the soil when allowed to decompose. Thus, the study would like to determine the effect of legume inoculation in the improvement of the yield of legumes using effective microorganisms.

The study aimed to:

1. determine the growth and yield of the different varieties of bush snap beans;
2. determine the effect of Benguet State University indigenous microbial organisms (IMO) inoculation on the bush snap bean varieties;

3. determine the interaction effect of BSU indigenous microbial organisms (IMO) inoculation and the different bush bean varieties; and

4. determine the profitability of using BSU indigenous microbial organisms IMO inoculation in bush snap bean production under La Trinidad, Benguet condition.

The study was conducted at the Benguet State University Experimental Station at Balili, La Trinidad, Benguet from November 2011 to January 2012.

REVIEW OF LITERATURE

Varietal Evaluation

Different varieties which were grown under the same method of culture have a great variation in the yielding ability. A variety that yields well in one region is not a guarantee that it will perform well in another region (Reily and Shry, 1991).

Bean performs best in soil that are well structured and heavy rich loam with an optimum ph range of 5.6-6.8. It is a short day crop, sensitive to photo period. Its growth and development are favored mildly by cool environments, while high temperatures delay flowering (Bawang, 2006).

Work and Carew (1995) states that varietal evaluation is important to observe the performance character such as yield, earliness, vigor, maturity and quality because different varieties have a wide range difference of a plant, in size and in yield performance.

Further, improving crop performance, productivity, plant breeding and using new developments in agricultural biotechnology will allow the increase in crop yields and maintenance of yield stability without increasing land usage (Reddy and Hodges, 2000).

Cultural Management Practices

The growth and yield of snap beans are best in high elevations. Yield was significantly low in lower evaluations maturity was longer in higher evaluations than in lower evaluations.

Dwarf or bush cultivars which do not require support are early maturing while the climbing or pole cultivars which require support take longer period of to mature and have a longer bearing season.

Ware and Swiader (2002) stated that seeds should be planted 0.5 to 1.0 inch deep in heavy soil and 1.5 inches in sandy soils so that they will obtain adequate moisture. Beans are moderately deep rooted crops in which a constant supply of moisture is needed to maximize yield and quality and to maintain uniformly. The plant should use as much as 0.2 inch of water per day during dry season. A shortage of moisture during flowering can cause blossoms and pods to drops. Deformed pods can result from water stress due to low soil moisture or excessive transpiration.

The flowering of “green matured” pods start 60 days from planting under La Trinidad condition (Kudan, 1991). In warmer area it is earlier to mature while in higher elevations takes longer period with cooler temperature. Harvesting is dependent on the variety used, location and temperature. Seeds are harvested after the pods are mature and when seed moisture content is approximately 16 to 20 percent. Harvesting and handling low-moisture beans (less than 14%) may result in mechanical and seed loss.

<u>Legumes and Rhizobium</u>

Legumes are crucial to the balance of nature. They convert nitrogen from the air into ammonia, a soluble form of nitrogen, which is readily utilized by plants. The ability of legume crops to fix atmospheric nitrogen often result in a lower utilization of inorganic nitrogen sources in the soil profile as compared to non-fixing crops. In this way, inorganic nitrogen is conserve for the following crops unless it is lost by votalization, leaching, or dentrification (Evans, 1991).

Rhizobial inoculation significantly increases the nodule weight and number during the first cropping but the effect of Rhizobial inoculation on nodulation was no longer detected during the succeeding legume crop.

Inoculation should be practiced to hasten the trapping of the atmospheric nitrogen. Inoculation introduces to the plant the bacteria, “Rhizobium” which is capable of trapping atmospheric nitrogen for plant use at early stage. The bacteria that multiply and grow on the roots of legumes change the nitrogen in the soil air biochemically in to a fixed from attached to the root nodules.

Fiarawan (2001) noted that in terms of plant height, pod yield and seed yield, there is significant interaction effect between the Rhizobial strains and rice bean varieties. The varieties inoculated with TAL 899 or TAL 117 produced the best potential for nodulation, nitrogen fixation and yield production. Inoculation of legume seed is usually recommended in order to obtain the highest rate of fixation.

There are many benefits derived from effective inoculation such as the reduction of demand for soil nitrogen, prevention of early nitrogen starvation and improvement of the grain and protein yield.

MATERIALS AND METHODS

A total land area of 150 m^2 was used in the experiment. The area was divided into three blocks, consisting of four plots each with a dimension of 1m x 5 m. The experimental area was laid-out in a split-plot design with three replications (Figure 1). Four entries of bush snap beans were used in the study. Two seeds were sown per hill at a distance of 20 cm between rows and 20 cm between hills. The different bush bean varieties and soil inoculation with indigenous microorganisms (IMO) served as treatments. Inoculants served as main plot while the bush snap bean varieties as sub-plot. The IMO that was used in this experiment were bought at the BSU Organic Market.

Main plot-Inoculation (IC)

IC_1- No Inoculation (Control)

IC_2- With inoculation

Sub plot-Bush Snap Bean Varieties (V)

V_1- Contender

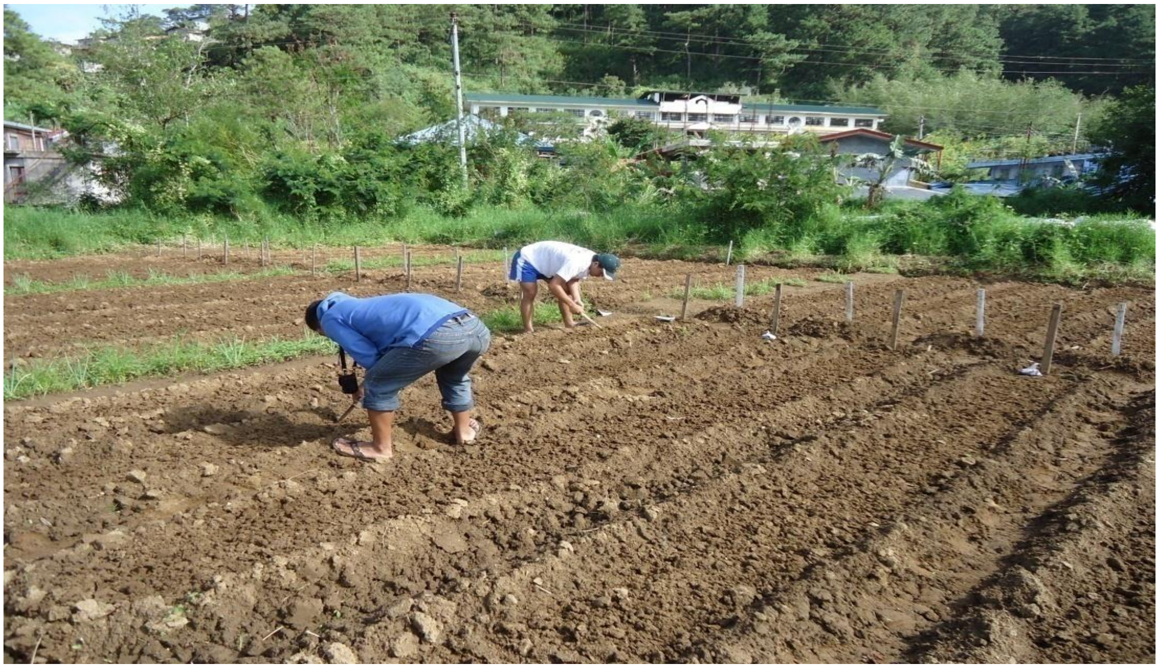
V_2- Hab 63

V_3- Sablan

V_4-Hab 19

The IMO and Procedure of Inoculation

Indigenous Microorganism is a wettable powder containing microbial bacteria. It was developed for seed/seedling inoculation, microbial Inoculants, compost activator and soil conditioner. Rhizobium is nitrogen- fixing bacteria present in the roots and reported



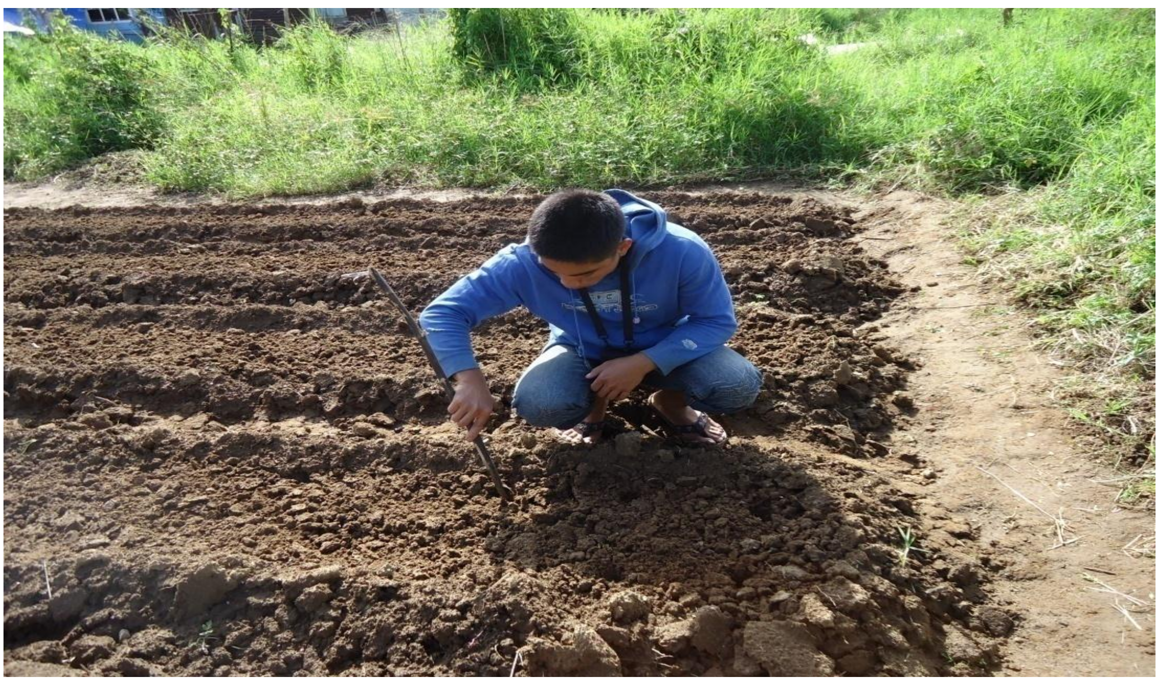


Figure 1. Overview of the experimental area and at planting

to fix atmospheric nitrogen and help in maintenance of soil fertility level. The IMO was developed by Mr. Eric Tinoyan from the BSU organic market. Which was collected from the forest at Klondykes, Camp One, Tuba Benguet. The method of application will be to sprinkle contents to 100 m^2 area before land preparation.

The data gathered were the following:

1. Number of days from sowing to emergence. This was recorded by counting the number of days from planting to the time at least 50% of plants have fully emerged.

2. Number of days from emergence to flowering. This was recorded by counting the days from emergence to the day when at least 50% of the plants have fully opened flowers.

3. Number of days from flowering to pod setting. This was recorded by counting the number of days starting from flowering to the day when pods set formed.

4. Number of days from emergence to first harvesting. This was recorded by counting days from emergence to first harvesting

5. Number of days from emergence to last harvesting. This was recorded by counting the number of days from emergence to last harvesting.

6. Initial plant height (cm). This was taken by measuring one week after emergence from the base to the plant at the ground level to the tip of the youngest shoots using the meter stick from ten sample plants.

7. Final plant height (cm). This was taken by measuring from the base of the plant at the ground level to the youngest shoots before the first harvest, using a meter stick from ten sample plants.

8. Number of flower cluster per plant. The numbers of flowers cluster per plant were counted from ten sample plants per plot.

9. Number of flowers per cluster. The numbers of flowers per cluster were counted from ten sample plants per plot.

10. Number of pods per cluster. The number of pods per cluster was counted from ten sample plants per plot.

11. Percentage pod set per cluster. This was determined using the formula:

$$\% \text{ Pod Setting} = \frac{\text{Total No. of Pods per Cluster}}{\text{Total No. of Flower per Cluster}} \times 100$$

12. Length of marketable pods (cm). Ten samples pods were picked at random from each plot and their length was measured from pedicel end to blossom end using the veirner caliper.

13. Width of marketable pods (cm). This was obtained by measuring ten random sample pods per plot using the veirner caliper.

14. Weight of marketable pods (kg). The marketable pods were harvested and weighted every harvesting period. Marketable must be free from insect pest, diseases and not deformed.

15. Weight of non-marketable pods (kg). The non marketable pods were those affected by insect pest, diseases, and deformed pods. It was weighed at harvest.

16. Total yield per plot. This was obtained by weighing all the harvested marketable fresh pods per plot.

17. Computed fresh pod yield per hectare. This was determined using the formula:

$$\text{Yield (t/ha)} = \text{Yield}/5\text{m}^2 \times 2$$

18. a) Reaction to pod borer. This was noted by assessing the degree of infestation by pod borer using the following scale used at BSU-IPB Highland Crop Research Station, (Tandang L. et al., 2008).

Scale	Description	Remarks
1	No infection	High resistance
2	1-25% of total plant/plot is infested	Mild resistance
3	26-50% of the total plant/plot is infested	Moderate resistances
4	51 - 75% of the total plant/plot is infested	Susceptible
5	76-100% of the total plant/plot is infested	Very susceptible

b) Reaction to bean rust. This was noted by assessing the degree of infection caused by bean rust that infested the crop using the following scale used at BSU-IPB, Highland Crop Research Station, (Tandang L. et al., 2008).

Scale	Description	Remarks
1	No infection	High resistance
2	1-25% of total plant/plot is infested	Mild resistance
3	26-50% of the total plant/plot is infested	Moderate resistances
4	51 - 75% of the total plant/plot is infested	Susceptible
5	76-100% of the total plant/plot is infested	Very susceptible

19. Return on Cash Expenses. This was computed using the following formula:

$$ROCE = \frac{\text{Gross Sales- Total Expenses}}{\text{Total Expenses}} \times 100$$

20. Agro-Climatic Data. The average monthly temperature, relative humidity, rainfall and sunshine duration was taken at Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Agronomical Meteorological Station.

Analysis of Data

All quantitative data were analyzed using the Analysis of Variance (ANOVA) for Split Plot Design with three replications. The significance of differences among the treatment means were tested using the Duncan's Multiple Range Test (DMRT) at 5% level of significance.

RESULTS AND DISCUSSION

Agro- climatic Data During
the Study Period

Table 1 shows the temperature, relative humidity, rainfall and sunshine duration during the study. Average temperature ranged from 15.5 to 19.5^{o}C, with a maximum temperature of 25^{o} C while the minimum temperature was 14^{o}C. The relative humidity was 84 to 87%, rainfall of 2.20 to 6.40 ml and sunshine duration of 244 to 340 mins.

The agro climatic data during the conduct of the study was favorable for bush bean production. Snap beans grow best in areas with temperature between 15^{0}C to 21^{0}C. Also, bush bean varieties can tolerate low temperature better than the climbing varieties (HARRDEC, 2000). Since the rainfall amount is not significant, regular irrigation was done.

Table 1 Agro-climatic data during the study period (November 2011-January 2012)

MONTHS	TEMPERATURE MAX (^{O}C)	MIN (^{O}C)	AVE (^{O}C)	RELATIVE HUMIDITY (%)	RAINFALL AMOUNT (mm)	SUNSHINE DURATION (min)
NOVEMBER	24	15	19.5	86	2.20	257
DECEMBER	17	14	15.5	87	6.40	244
JANUARY	25	14	19.5	84	3.20	340

Days from Sowing to Emergence,
Flowering, Pod Set, and Harvesting

Effect of inoculation. There were no significant differences observed on the number of days to emergence, flowering, and pod setting and to harvesting of the four bush snap bean varieties as affected by the inoculation of BSU indigenous microbial organism (IMO).

Effect of variety. The result showed no significant differences on the number of days from sowing to emergence, flowering, and pod setting and to harvesting. The four bush snap bean varieties uniformly emerged eight days after sowing, flowered 33 days from sowing and set pods eight days from flowering as shown in Table 1. Harvesting was done at 55 and 59 days from sowing.

Interaction effect. No significant interaction effect was observed on the four bush bean varieties and inoculation on the number of days from sowing to emergence, flowering, pod setting and to harvesting.

Table 2. Days from sowing to emergence, flowering, pod set, and harvesting of the four bush bean varieties applied with inoculants

TREATMENT	DAYS FROM SOWING TO			HARVESTING	
	EMERGENCE	FLOWERING	POD SET	FIRST	LAST
Inoculation (A)					
W/ BSU IMO	8	33	41	55	59
W/o BSU IMO	8	33	41	55	59
Variety (B)					
Contender	8	33	41	55	59
Sablan	8	33	41	55	59
Han 19	8	33	41	55	59
Hab 63	8	33	41	55	59
AxB	ns	ns	ns	ns	ns
CV (a) %	0	0	0	0	0

CV (b) %	0	0	0	0	0

Plant Height

Effect of inoculation. There were no significant differences among the four bush snap bean varieties and the application of BSU indigenous microbial organisms (IMO) on the plant height at 14 and 48 days after sowing. The final mean height ranges from 26.42 to 28.33cm.

Effect of variety. The plant height at 14 DAS of the four bush snap beans varieties was significantly different. Hab 19 was the tallest plant with an initial height of 12.21cm while the shortest plant was Contender with a height of 11.50cm. No significances on the final plant height of the different varieties were recorded.

The significant differences could be attributed to the inherent characteristics of the entries and adaptability to climatic condition. Plant height could influence the number of pods per plants even in dwarf varieties. The taller the plants, the higher the number of pods per plant that could be expected due to possible higher photosynthetic rate brought about by longer sunshine duration (Borricano, 2008).

Interaction effect. There were no significant interaction effects between the inoculation of BSU indigenous microbial organisms and the four bush snap bean varieties on the height of the plants at 14 and 48 DAS.

Table 3. Plant height of the four bush bean varieties applied with inoculants

TREATMENT	HEIGHT (cm)	
	INITIAL (14 DAS)	FINAL (48 DAS)
Inoculation (A)		
W/ BSU IMO	11.79	28.33
W/o BSU IMO	11.72	26.42
Variety (B)		
Contender	11.50^{c}	27.00
Hab 63	11.80^{b}	27.50
Sablan	11.60^{bc}	27.33
Hab 19	12.12^{a}	27.67
AxB	ns	ns
CV (a) %	6.51	4.89
CV (b) %	1.85	3.52

Means with same letter are not significantly different at 5% level by DMRT.

Number of Flower Cluster, Flower per Cluster,
Pods per Cluster and Percent Pod Setting

Effect of inoculation. No significant differences on the number of flower cluster, number of flower per cluster, percentage of pods per cluster and the number of pods per cluster as affected by the inoculation of BSU indigenous microbial organisms (IMO) on the four bush snap bean varieties as shown in Table 4.

Effect of variety. The results showed that there were no significant differences between the varieties on the number of flower cluster, number of flower per cluster, percent of pods per cluster and pods per cluster produced as shown in Figure 2. Numerically, Hab 63 had the highest percent pod setting of 63.55%.

Interaction effect. There was no significant interaction effect between the inoculations of BSU indigenous microbial organisms among the four varieties of bush snap beans on the number of flower cluster produced, number of flower per cluster, percent pod setting.

Table 4. Number of flower cluster, pods per cluster, percent pod setting, and flower per cluster of the four bush bean varieties applied with inoculants

TREATMENT	NUMBER			
	FLOWER CLUSTER	FLOWER PER CLUSTER	PODS PER CLUSTER	%POD SETTING
Inoculation (A)				
W/ BSU IMO	3.56	3.44	2.20	62.45
W/o BSU IMO	3.50	3.48	2.15	61.82
Variety (B)				
Contender	3.48	3.37	2.18	61.70
Hab 63	3.52	3.42	2.17	63.55
Sablan	3.52	3.48	2.18	62.78
Hab 19	3.60	3.58	2.17	60.52
AxB	ns	ns	ns	ns
CV (a) %	4.48	1.58	4.36	1.6
CV (b) %	7.40	6.39	4.20	1.7

Means followed by common letter are not significantly different at 5% level DMRT.

Figure 2. Flower and pod cluster of the bush bean varieties inoculated with BSU-IM

Reaction to Pod Borer and Bean Rust

Regardless of the inoculation treatment and the different bush bean varieties used, all of the plants showed mild resistance to pod borer and bean rust except for Hab 63 with moderate resistance to pod borer. The plants inoculated with BSU-indigenous microbial organisms (IMO) showed 1-25% infection and infestation of the total plant per $5m^2$.

Pod Width and Length

Effect of inoculation. There was no significant differences on the effect of BSU indigenous microbial organisms (IMO) inoculation on the pod width and length of the four varieties of bush snap beans with 0.79 to 0.81 cm. On the pod length, application of BSU-IMO significantly produce the longest pod of 13.98cm. Pod length is one of the criteria use to determine the marketability of legume pods. Consumers and buyers of beans usually prefer longer pods than shorter ones (Viernes, 2000).

Effect of variety. No significant difference was noted on the different varieties of bush snap beans in terms of width of marketable pods. In terms of length Contender and Hab 19 significantly produced the longest pods of 14.16 and 13.88cm but comparable with Sablan (13.41 cm). On the contrary, the snap bean with narrow pods are considered to be desirable in the market and generally preferred by consumers (Calya-en, 2009).

Interaction effect. There were no significant interaction was recorded in terms of pod length and width as affected by the inoculation of BSU indigenous microbial organisms and the four varieties of bush snap beans.

Table 5. Width and length of marketable pods of the four bush snap bean varieties applied with inoculants

TREATMENT	POD	
	WIDTH (cm)	LENGTH (cm)
Inoculation (A)		
W/ BSU IMO	0.79	13.98[a]
W/o BSU IMO	0.8	13.65[b]
Variety (B)		
Contender	0.79	14.16[a]
Hab 63	0.77	13.41[b]
Sablan	0.81	13.41[ab]
Hab 19	0.81	13.88[a]
AxB	ns	ns
CV (a) %	2.7	0.61
CV (b) %	4.54	2.44

Means with common letter are not significantly different at 5% level DMRT.

Marketable and Non-marketable
Yield, Total and Computed Yield

Effect of inoculation. Inoculation did not significantly increase the weight of marketable, non-marketable fresh pods, total and computed yield. The four varieties of bush snap bean mean yield range from 1.12 to 1.22kg/3m^2 and 0.33 to 0.36 kg/3m^2, respectively. As cited by Giller and Wilson (1991), *Phaseolus vulgaris* was considered as poor nitrogen fixing grain legumes but under optional conditions, nitrogen fixation is up to 72% of nitrogen and in longer growing seasons amounts to 125kg /ha.

Effect of variety. Table 6 and Figure 3 showed that there was no significant differences among the four varieties as observed in terms of marketable and non-marketable weight of fresh pods. Numerically, Hab 63 produced the heaviest marketable pods (1.83kg/3m^2), while Sablan had the lowest non-marketable pods (0.30kg/3m^2). The lowest was recorded in Hab 19 (0.10kg/3m^2). Computed yield ranges from 4.86 to

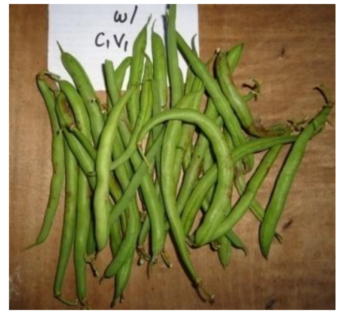
5.26tons/ha. Low yield was attributed to the unexpected and unreasonable actions of some people; all of the unharvested pods of the four bush snap bean varieties were stolen. Harvesting was done twice only.

Interaction effect. No significant interaction effect was noted in terms of the marketable, non-marketable weight of fresh pods, total and computed yield of the four varieties of bush snap beans and the inoculation of BSU indigenous microbial organisms (IMO).

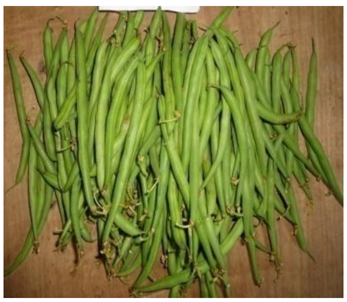
Table 6. Yield of marketable and non-marketable pods (kg/3m^2) of the four bush snap bean applied with inoculants

TREATMENT	YIELD (Kg/3m^2)			COMPUTED YIELD (t/ha)
	MARKETABLE	NON MARKETABLE	TOTAL	
Inoculation (A)				
W/ BSU IMO	1.12	0.36	1.49	4.97
W/o BSU IMO	1.22	0.33	1.58	5.27
Variety (B)				
Contender	1.23	0.38	1.62	5.41
Hab 63	1.83	0.32	1.48	4.93
Sablan	1.20	0.30	1.53	5.10
Hab 19	1.10	0.37	1.50	5.00
AxB	ns	ns	ns	ns
CV (a) %	8.88	4.87	12.72	13.76
CV (b) %	8.85	6.43	26.51	28.21

Contender



Marketable | Non-marketable



Hab 63

Marketable | Non-marketable

Sablan

Marketable | Non-marketable

Hab 19

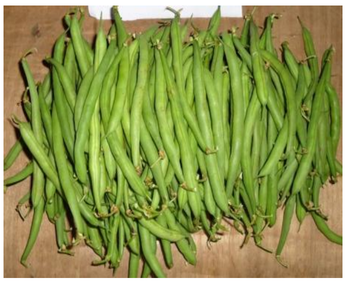
Marketable | Non-marketable

Figure 3. Marketable and non-marketable pods inoculated with BSU-IMO

Marketable

Contender

Non-marketable



Marketable

Hab 63

Non-marketable

Marketable

Sablan

Non-marketable

Marketable

Hab 19

Non-marketable

Figure 4. Marketable and non-marketable pods without inoculation of BSU-IMO

Return on Cash Expense

Effect of inoculation. As shown in Table 7, inoculation gave the least return on cash expense of 6 to 29% while no application of inoculation realized an average of 458% ROCE. The high cost of inoculant attribute to low ROCE obtained.

Effect of variety. Among the varieties, Contender obtained the highest ROCE (235%) while the lowest was recorded in Hab 19 (227%).

Interaction effect. Bush bean varieties Sablan and Hab 63 not applied with inoculants recorded the highest ROCE of 476%. On the contrary, the same varieties had the lowest ROCE when applied with BSU-IMO of 6%.

Table 8 Return on Cash Expense of the four Bush Bean varieties applied with inoculants

TREATMENT	YIELD ($Kg/9m^2$)	GROSS INCOME (PhP)	COST OF PRODUCTION (PhP)	NET INCOME (PhP)	ROCE (%)
W/ BSU IMO					
Contender	5.1	91.80	71.25	20.55	29
Sablan	4.2	75.60	71.25	4.35	6
Hab 63	4.2	75.60	1.25	4.35	6
Hab 19	4.5	81.00	71.25	9.75	14
Mean					14
W/o BSU IMO					
Contender	4.5	81.00	15.00	66.00	440
Sablan	4.8	86.4	15.00	71.40	476
Hab 63	4.8	86.4	15.00	71.40	476
Hab 19	4.5	81.00	15.00	66.00	440
Mean					458

Selling price = PhP18.00/kg
Expenses = Inoculants at PhP125/bag x 3 bags; seed cost at PhP50.00/125g

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The effect of inoculation with Benguet State University Indigenous Microbial Organisms (BSU-IMO) on four bush snap bean varieties were studied. The different varieties used were Contender, Sablan, Hab 63 and Hab 19. The study was conducted at the experimental station of Benguet State University at Balili, La Trinidad, Benguet on November 2011 to January 2012.

Among the inoculation treatments used, no significant differences were observed in most of the parameters measured except on the pod length where the longest pods was recorded in bush bean applied with BSU-IMO. Also the highest ROCE was obtained in bush beans without inoculation.

There were no significant differences among the four bush snap bean on the growth and yield parameters except for pod length. Contender and Hab 19 had the longest pods comparable with Sablan.

Highest ROCE was obtained in plants without inoculation, although positive ROCE was obtained in all the varieties either with or without inoculation.

No significant interaction effect was noted in all the data measured as affected by the application of inoculation and the different bush bean varieties.

Conclusion

Results of the study show that inoculation of BSU indigenous microbial organisms does not affect the growth and yield of bush beans and not profitable for bush bean production.

Findings show also that all of the varieties had a comparable performance in terms of growth and yield. Although, Contender had the highest ROCE.

It is further concluded that non-inoculation and bush bean varieties, Sablan and Hab19 be used for it gave the highest return on cash expense.

Recommendation

On bush bean production, inoculation with BSU indigenous microbial organisms is not recommended while all the four varieties maybe used.

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