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Integrated Management of Foot Rot of Grasspea *(Lathyrus sativus)* Using Bio control Agents under Field Condition

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Integrated management, foot rot, **Grasspea** *(Lathyrus sativus)*, biocontrol agents, field condition.

A B S T R A C T
The experiment were conducted in the field laboratory of the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh. The field experiments were carried out to find out the effect of cowdung, Bangladesh Institute of Nuclear Agriculture (BINA)-biofertilizer (BINA)-Biofertilizer and Bangladesh Agricultural University (BAU)-Biofungicide either alone or in combination in controlling foot rot disease of Grasspea (*Lathyrus sativus*). It has been observed that application of cowdung in the soil and seed treatment with BINA-Biofertilizer and BAU-Biofungicide either alone or in combination has the great effect on germination of seeds, post-emergence death of plants, plant stand, shoot and root length, fresh and dry weight of shoot and root, number of nodule/plant and weight of nodule/plant and Biomass production of Grass pea. BAU-Biofungicide resulted significant higher germination of seeds of Grasspea over all other treatments. The germination of BAU-Biofungicide treated seeds of Grasspea was 85.33%, respectively which showed up 25.49%, respectively higher germination over the control (untreated). Post-emergence deaths of plants due to foot rot disease were significantly reduced after combined seed treatment with BINA-biofertilizer and BAU-biofungicide. The maximum plant stand (96.94%) was recorded by applying cowdung and BINA-Biofertilizer in soil + treating seeds of grasspea with BAU-Biofungicide which

was followed by applying cowdung and BINA-Biofertilizer in soil + seed treatment with BAU-Biofungicide (94.94%). But minimum plant stand (74.17%) was recorded in controlUse of BINA-biofertilizer and BAU-biofungicide as seed treating biocontrol agents and application of cowdung in the soil as an organic source of nutrient resulted in higher shoot and root lengths, and dry shoot and root weights of **Grass pea** . BINA-biofertilizer significantly increased the number of nodules per plant and nodules weight of **Grass pea** *(Lathyrus sativus*). Seeds treating with BAU-biofungicide and BINA-biofertilizer and soil amendment with cowdung increased the biomass production of **Grasspea** up to 36.10 % over the control.

1. INTRODUCTION

For disease development of pulses different phytopathogenic soilborne as well as seedborne fungi are responsible, those fungi attack plants during seedling to maturity stages and are more destructive at the seedling stage [8]. Foot rot (causal agents F. oxysporum and S. rolfsii) is considered as an important and destructive disease of pulses in almost all legume-growing countries of the world [1]. Control of the soilborne pathogens F. oxysporum and S. rolfsii with chemicals is practically difficult. On the other hand, indiscriminate use of chemicals causes environmental pollution and health hazards [9]. Nowadays, integrated Disease Management (IDM) is very much popular for controlling plant diseases. There are several tactics within IDM, among them biological control being one of the most important tactics [18]. Trichoderma may be used as an ecofriendly biocontrol agent in this regard. The biocontrol agent Trichoderma has the potential to protect seedlings against several plant pathogenic fungi. Trichoderma spp. have been widely used as antagonistic fungal agents against several pests as well as plant growth enhancers **[28]**. Trichoderma harzianum has been reported to be effective in controlling seed- and soilborne diseases of different crops, namely legumes and vegetables [2, 6, 12, 20, 24, 26]. The use of antagonistic bacteria as a biological control means may provide a great alternative for plant pathologists **[11].** Hossain et al. **[11]** also reported prominent antagonistic effect of Rhizobium against foot and root rot pathogens (F. oxysporum and S. rolfsii) of pulses. This antagonist also increased the percentage of seedling emergence, plant height, fresh weight, and vigour index **[12,22].** Application of cowdung and manures in the soil is aimed to supply nutrients to the crops, creating a positive environment of inducing disease resistance to the plant. As a result, plants may recover from the disease or be resistant to disease, or overcome the disease epidemic [14, 17]. Considering the above facts the present study was undertaken to find out the effect of cowdung, BINA-biofertilizer (peat-based R. leguminosarum), and BAU-biofungicide (organic substrate-based T. harzianum), either alone or in combination on foot rot disease of **Grass pea** under field conditions.

MATERIALS AND METHODS

All material for experiment that is BINA-Biofertilizer Peat-based biofertilizer was collected from the Soil Microbiology Laboratory of the Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangladesh. The composition of the bio-fertilizer was peat soil and Rhizobium

leguminosarum. The R. leguminosarum was firstly collected from the nodules of legume plants. After collection, Rhizobium broth was prepared. Sterilized 500 g peat soil was poured in a polythene bag and inoculated with a previously prepared 5 ml broth of R. leguminosarum (1011 CFU/ml) and mixed thoroughly for proper distribution. Then the materials were incubated for 7 days at 25 ± 2o C. After 7 days of incubation, it was ready for use. The material can be stored up to 6 months at 22 ± 1o C for future use.

Collection of BAU-Biofungicide

Another materials that is BAU-biofungicide was collected from the Disease Resistance Laboratory, Department of Plant Pathology, BAU, Mymensingh, Bangladesh. BAU-biofungicide was invented from a naturally occurring fungus, Trichoderma harzianum growing on an organic substrate (black gram bran). The T. harzianum was firstly collected from the rhizosphere of a **Grasspea** field. The isolated fungi were cultured on potato dextrose agar (PDA) at 28 ± 2o C. Then 50 g of black gram bran was moistened with 1.5 ml of water and sterilized in an autoclave. After cooling, the sterilized substrate was inoculated with previously prepared 7-dayold culture of T. harzianum (four to five 1 cm block of T. harzianum). After 7 days of incubation, it was ready for use. The material can be stored up to 6 months at 22 ± 1o C for future use

Collection of Seeds of Pulse

Seed samples *local variety* of **Grasspea** *(Lathyrus sativus*) were collected from seed shop of Natun Bazar market of Mymensingh town, Mymensingh, Bangladesh. The collected seeds were kept in a paper bag and stored in the refrigerator at 5-7o C for one month for subsequent studies.

Seed Treatment

The seeds were taken in a beaker as per required amounts and a few drops of water were added for moistening the seed surface uniformly to allow maximum adherence of BAU-biofungicide on the whole surface of seeds. Seeds were treated with BAU-biofungicide at 2.5% weight of seeds until the whole surface of the seeds were coated, where 2.5% biofungicide contained 106 conidia [19]. For seed coating with biofertilizer, seeds were initially moistened with water. Then the seeds were thoroughly mixed with biofertilizer (at 2.5% of seed weight) where the biofertilzer contained 108 Rhizobium cells/mg formulations. The inoculant-coated seeds were placed in a cool and dry place under shade for drying. The treated seeds were kept in paper bags and stored in the refrigerator at 5-7o C for one month for subsequent studies.

In the present study, the following treatments were used:

Control
Cowdung
BINA-biofertilizer
BAU-biofungicide
Cowdung + BINA-biofertilizer
Cowdung + BAU-biofungicide
BINA-biofertilizer + BAU-biofungicide
Cowdung + BINA-biofertilizer + BAU-biofungicide Cowdung

(5 t/ha) was mixed with the soil during the final land preparation as per treatment specification [15].

Field Experiment

Seed sowing. The field experiment was conducted in a randomized block design with 3 replications.

The size of the individual plot was 2 m × 1 m, and the spaces between the plots and blocks were 1 m and 1 m, respectively. Treated seeds were sown (35 kg/ha) in lines about 2.0 cm in depth and the seeds were immediately covered with soil. Two times of weeding were preformed, one after 25 days and another 40 days after sowing. No plant protecting chemicals (insecticides or fungicides) were applied in the field.

Determination of foot rot disease.

The experimental plants with in plots were inspected routinely to observe the foot rot disease on plant. In case of complexity to identify the disease, symptoms-bearing plants were collected from the field using polythene bag and brought to the Disease Resistance Laboratory, Department of Plant Pathology, BAU, Mymensingh. From the infected plants, the fungi were isolated following tissue planting methods [4]. After incubation, the fungi that grew over potato dextrose agar (PDA) were purified by the hyphal tip culture method. The isolated fungi were identified as F. oxysporum and S. rolfsii according to reference mycology books and manuals [3, 5, 25]. The pure cultures of the fungi were preserved in PDA slants at 4°C in the refrigerator as stock culture for future use.

Data collection and analysis.

Data on different parameters (viz., germination, post-emergence death of plants, plant stand, shoot length, root length, dry shoot weight, dry root weight, number of nodule/plant, weight of nodule/plant, and biomass) were taken. Five plants were randomly selected and uprooted carefully from each plot for recording data. Data were expressed as the means ± standard errors. The results were analyzed using the SPSS statistical package (ver. 16, SPSS Inc.,Chicago, IL, USA) and Microsoft excel program.

RESULTS

Table 1. Effect of Cowdung, BINA-Biofertilizer, and BAU-Biofungicide Either Alone or in Combination on Germination, Post-Emergence Death of Plants, and Plant Stand of Grass pea

Treatment	**Germination (%)**	**Post emergence death (%)**	**Plant stand (%)**
T_1 = Control	68.00c	25.83a	74.17c
T_2 = Cowdung	70.67c (+ 3.92)	20.70a (- 19.86)	78.62bc (+ 5.99)
T_3 = BINA-Biofertilizer	78.67abc (+ 15.69)	11.913b (- 53.88)	89.42ab (+ 20.56)
T_4 = BAU-Biofungicide	85.33a (+ 25.49)	6.067c (- 76.51)	94.26a (+ 27.09)
T_5 = Cowdung + BINA- Biofertilizer	81.50ab (+ 19.85)	11.95b (- 53.73)	88.38ab (+ 19.16)
T_6 = Cowdung + BAU-Biofungicide	78.83abc (+ 15.92)	7.810c (- 69.76)	92.38a (+ 24.55)

T_7 = BINA-Biofertilizer + BAU-Biofungicide	76.00bc (+ 11.76)	4.143c (- 83.96)	95.86a (+ 29.24)
T_8 = Cowdung + BINA-Biofertilizer + BAU-Biofungicide	74.00bc (+ 8.82))	3.397c (- 86.10)	96.94a (+ 30.60)
LSD ($p \geq 0.05$)	9.864	4.832	9.864

Data represents the mean of three replications.
Data in parenthesis indicate % increase or decrease over control.
% increase (+)
% decrease (-)

The effects of cowdung, BINA-biofertilizer, and BAU-biofungicide either alone or in combination on germination of **Grasspea** (Local Variety) is shown in Table 1. The treatments resulted in significant effects on the germination of seeds of **Grasspea**. The highest germination (85.33%) was recorded by treating seeds with BAU-biofungicide & application of cowdung in the soil as an organic source of nutrient, and the result was statistically identical with cowdung, BINA-biofertilizer, BAU-biofungicide, cowdung + BINA-biofertilizer, cowdung + BAU-biofungicide, and BINA-biofertilizer + BAU-biofungicide, whereas the lowest germination (68%) was recorded in the control .The seed germination of grasspea was found to be increased by treating the seeds only with BAU-Biofungicide up to 25.49% over the control (untreated seeds). The post-emergence death of **Grass pea** plants due to foot rot was found to be caused by F. oxysporum and S. rolfsii. The minimum post emergence death of plants (4.14%) was obtained by treatment of seeds with BAU-biofungicide which was followed by BINA-biofertilizer, cowdung + BAU-biofungicide, and cowdung + BINAbiofertilizer + BAU-biofungicide, respectively and It has been observed that BINA-Biofertilizer and cowdung applying in the soil and treating seed with BAU-Biofungicide decreased post-emergence death of plants up to 86.10% over control. The maximum plant stand (96.94%) was obtained by seed treatment with BAU-biofungicide, which was statistically identical with the combinations of seed treatment with BINA-biofertilizer + BAU-biofungicide (81.50%). The lowest plant stand (74.17%) was recorded in the control. It has been found that all treatments increase the plant stand over the control and applying cowdung and BINA-Biofertilizer in the soil + treating seeds with BAU-Biofungicide increase plant stand up to 30.60% over the control.

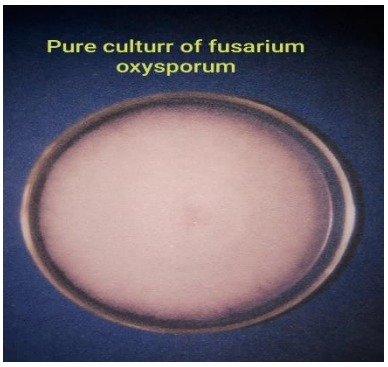

Fig: Pathogen Fusarium Oxysporum & Sclerotium rolfsi (Above) & Healthy & foot rotted plant and also poor plant and having foot rotted plant in control plot

Table-2 .Effect of Cowdung, BINA-Biofertilizer and BAU-Biofungicide Either Alone or in Combination on Shoot and Root Lengths of Grasspea (var. Local Variety)

Treatment	**Shoot length (cm)**			**Root length (cm)**		
	60 DAS	**80 DAS**	**110 DAS**	**60 DAS**	**80 DAS**	**110 DAS**
T_1 = Control	8.42b	72.40c	74.07bc	5.93b	8.03b	8.73
T_2 = Cowdung	8.80b	71.00c	76.33bc	6.33b	8.80b	10.07
T_3 = BINA-Biofertilizer	8.93b	73.47bc	81.40ab	6.93b	8.42b	8.80
T_4 = BAU-Biofungicide	11.33a	84.67a	85.53ab	9.07a	11.33a	11.67
T_5 = Cowdung + BINA- Biofertilizer	9.83ab	81.53ab	81.80ab	7.20b	9.83ab	9.88
T_6 = Cowdung + BAU- Biofungicide	9.33b	78.20abc	79.00bc	7.40b	9.33b	9.87
T_7 = BINA-Biofertilizer +BAU-Biofungicide	10.10ab	80.00abc	86.27a	9.27a	10.10ab	10.85
T_8 = Cowdung + BINA- Biofertilizer +BAU -fungicide	9.37b	75.67abc	86.33ab	6.67b	9.37b	10.00
LSD ($p \geq 0.05$) LSD ($p \geq 0.01$)	1.809	7.662	8.272		1.809	NS

DAS = Days after sowing.

NS = Not significant

Data represents the mean of three replications.

Effect of cowdung, BINA-Biofertilizer and BAU-Biofungicide alone or in combination was evaluated regarding shoot length of plants (Table-2). The effect of different treatments on shoot length of grasspea at 60 DAS, 80 DAS and 110 DAS showed marked variation. At 60 DAS and 80 DAS the maximum shoot lengths by 11.33 cm and 84.67 cm respectively recorded in case of seed treating BAU-Biofungicide while the minimum shoot lengths at 60 DAS and 80 DAS were 8.42 cm in control and 71.00 cm when the cowdung applied in soil which was followed by control (72.40 cm). In case of 110 DAS the maximum shoot length (86.27 cm) was recorded when applying BINA-Biofertilizer in

the soil and treating seeds with BAU-Biofungicide and minimum shoot length was 74.07 cm in control.

The length of roots at 60 DAS and 80 DAS varied significantly under different treatments (Table 2). The highest root length at 60 DAS (9.27 cm) was recorded when applying the BINA-Biofertilizer in soil + treating seeds with BAU-Biofungicide which was followed by seed treating with BAU-Biofungicide (9.07 cm) while lowest root length (5.93 cm) at 60 DAS was recorded in control.

At 80 DAS the highest root length (11.33 cm) was recorded when seeds were treated with BAU-Biofungicide and lowest root length (8.03 cm) was recorded in control.

Table-3. Effects of Cowdung, BINA-Biofertilizer, and BAUBiofungicide Either Alone or in Combination on Dry Shoot and Root Weight, Number of Nodule/Plant, and Weight of Nodule/Plant of Grasspea

Treatment	Dry shoot weight (g)		Dry root weight (g)		Number of nodule/ plant		Weight of nodule/ plant (g)	
	80 DAS	110 DAS	80 DAS	110 DAS	60 DAS	80 DAS	60 DAS	80 DAS
T_1 = Control	9.39c	7.56	1.307	0.6033b	9.33c	6.00c	0.2813c	0.7633c
T_2 = Cowdung	10.24c	4.67	1.347	0.6193b	12.20b	6.67bc (11.16)	0.4167bc	1.133bc (48.43)
T_3 = BINA-Biofertilizer	15.15ab	6.48	1.350	0.6393b	19.40a	9.33ab (55.50)	0.8947a	1.600ab (109.61)
T_4 = BAU-Biofungicide	15.96a	6.67	1.413	0.9387a	15.53b	6.67bc (11.16)	0.6367ab	1.957a (156.38)
T_5 = Cowdung + BINA-Biofertilizer	12.32abc	6.76	1.313	0.6280b	17.93ab	10.33a (72.16)	0.5860abc	1.350abc (76.86)
T_6 = Cowdung + BAU-Biofungicide	10.85bc	5.57	1.327	0.6507b	12.33c	8.00abc (33.33)	0.6293ab	0.9467bc (24.02)
T_7 = BINA-Biofertilizer + BAU-Biofungicide	11.94c	6.61	1.363	0.6867b	15.33b	8.67abc (44.50)	0.6727ab	0.9700bc (27.07)
T_8 = Cowdung + BINA-Biofertilizer + BAU-Biofungicide	12.29abc	6.22	1.360	0.9133a	16.33b	10.67a (77.83)	0.5387bc	1.467a (92.19)
LSD (p ≥0.05)	4.078	NS	NS	0.1537	2.802	2.863	0.2930	0.6265

DAS = Days after sowing.

NS = Not significant

Data represents the mean of three replications.

In case of dry weight of shoot of grasspea wide range of variation has been observed (Table-3). The maximum dry shoot weight (15.96 g) at 80 DAS was recorded in case of treating seeds with BAU-Biofungicide while minimum dry shoot weight (9.39 g) at 80 DAS was recorded in control (untreated). Dry shoot weight at 110 DAS showed in significant.

Maximum dry root weight (0.9387 g) at 110 DAS were recorded when seeds were treated with BAU-Biofungicide which was followed by applying cowdung and BINA-Biofertilizer in the soil and were seed treated with BAU-Biofungicide (0.9133 g). On the other hand at 110 DAS the minimum dry root weight (0.6033 g) was recorded in case of control. Cowdung, BINA-Biofertilizer and BAU-Biofungicide alone or in combination increased fresh root weight at 80 DAS (Table -3).

Cowdung, BINA-Biofertilizer and BAU-Biofungicide either alone or in combination showed significant effect on number of nodule/plant (Table -3). Maximum number of nodule (19.40) at 60 DAS were recorded when seeds were treated with BINA-Biofertilizer and minimum number of nodule (9.33) was recorded in control. At 80 DAS the maximum number of nodule (10.67) was recorded when applying cowdung and BINA-Biofertilizer in soil and seeds were treated with BAU-Biofungicide while the minimum number of nodule (6.00) was recorded in control (untreated). It has been found that applying cowdung BINA-Biofertilizer in soil and treating seeds with BAU-Biofungicide increased number of nodule up to 77.83% over control.

Maximum weight of nodule (0.8947 g) at 60 DAS was recorded when the seeds were treated with BINA-Biofertilizer, which was followed by application of BINA-Biofungicide in soil and treating seeds with BAU-Biofungicide (0.5387 g), while the minimum weight of nodule at 60 DAS was recorded in control (Table-3).

At 80 DAS the maximum weight of nodule (1.957 g) was recorded when seeds were treating with BAU-Biofungicide while the minimum weight of nodule (0.7633 g) at 80 DAS as recorded in control. It has been found that BAU-Biofungicide to be increased weight of nodule up to 156.38% over the control (untreated).

Table-4. Effect of cowdung, BINA-Biofertilizer and BAU-Biofungicide either alone or in combination on Biomass production of chickpea at harvest

Treatment	Biomass per plot at	Biomass at harvest
T_1 = Control	1275c	6.37d
T_2 = Cowdung	1333bc	6.67cd (4.70)

T_3 = BINA-Biofertilizer	1533ab	7.67abc (20.40)
T_4 = BAU-Biofungicide	1733a	8.67a (36.10)
T_5 = Cowdung + BINA- Biofertilizer	1367bc	6.84cd (7.69)
T_6 = Cowdung + BAU-Biofungicide	1325bc	6.63cd (4.08)
T_7 = BINA-Biofertilizer +BAU-Biofungicide	1508ab	7.54bc (18.39)
T_8 = Cowdung + BINA-Biofertilizer + BAU-Biofungicide	1683a	8.42ab (32.18)
LSD ($p \geq 0.05$)	210.80	0.9692

Data represents the mean of three replications.
Data in parenthesis indicate % increase over control.

Cowdung, BINA-Biofertilizer and BAU-Biofungicide either alone or in combination showed significant effect on Biomass production of grasspea (Table -4). The maximum Biomass production 1733 g/plot or 8.67 t/ha was recorded when the seeds were treated with BAU-Biofungicide which was followed by applying cowdung and BINA-Biofertilizer in the soil and treating seeds with BAU-Biofungicide (1683 g/plot or 8.42 t/ha). On the other hand the minimum Biomass production (1275 g/plot or 6.37 t/ha) was recorded in control (untreated seeds).

It has been observed that treating seeds with BAU-Biofungicide increased Biomass production up to 36.10% over control.

DISCUSSION

The field experiments were carried out to find out the effects of cowdung, BINA-biofertilizer, and BAU-biofungicide either alone or in combination in controlling foot rot disease of **Grass pea** (Local Variety). It has been observed that application of cowdung in the soil and seed treatment with BINA-biofertilizer and BAU-biofungicide either alone or in combination have a great effect on germination of seeds, post-emergence death of plants, plant stand, shoot and root length, dry weight of shoot and root, number of nodule/ plant, weight of nodule/plant, and biomass production of **Grass pea.** Application of BAU-Biofungicide either alone or in combination with BINA-biofertilizer resulted significant higher germination of seeds of pulses over all other treatments. The germination of BAU-Biofungicide treated seeds of Grasspea were 85.33%, respectively which showed up to 25.49%, respectively higher germination over the control (untreated). The findings of the present study have been supported by Chowdhury et al. (2000) reported that seed treatment with Trichoderma increased germination of Mungbean, blackgram, pigeon pea and tomato up to 21.16%, 53.60%, 26.64% and 48.43%, respectively over the control[30].Hossain and Fakir (2001) used antagonist

Trichoderma as seed treating agents of okra, bottle gourd, sweet gourd, white gourd, sanke gourd, cucumbr, mungbean, blackgram, pigeon pea and tomato. Treating of seeds with Trichoderma increased germination by 80%, 90.00%, 36.11%, 21.61%, 53.50%, 26.64%, 48.43% in okra, bottle gourd, sweet gourd, mungbean, black gram, pigeon pea and tomato, respectively[10].In another study, increased germination of sweet gourd seed up to 13% over control with the same antagonist has also been observed [13, 22]. Hossain and Shamsuzzaman (2003) and Shamsuzzaman et al. (2003) reported that BAU-Biofungicide increased germination of sweet gourd seed up to 13% over control (untreated) [31].

Naznin, H.A. and I. Hossain. 2004, reported germination of sweet gourd, snake gourd, cowpea, cucumber and okra by 5.22%, 2.35%, 46.024%, 7.92% and 50.80%, respectively over the control by using BAU-Biofungicide[32].

Bhuiyan (2005) reported upto 22.0% increased germination of seeds of vegetables by treating seeds with BAU-Biofungicide. [33].

Post-emergence death of plants of grasspea due to foot rot (Fusarium oxysporum and Sclerotium rolfsii) was found to be reduced by Treating seeds with BAU-Biofungicide and BINA-Biofertilizer either alone or in combination. Seed treatment with BAU-Biofungicide reduced post-emergence death of plants of grasspea up to 86.10% respectively over the control.This has been supported other researchers. Sivan, A. and I. Chet. 1986. recorded decrease in diseases incidence on tomato, watermelon and cotton by using Trichoderma. Sivan et al. [34].Ehtheshmul-Haque et al. (1990) used successfully T. harzianum as a biocontrol agent for controlling root rot disease of okra, sunflower, soybean and muskmelon caused by Fusarium and Thizoctonia[35].The mycoparasitism of both T. harzianum and T. longibrachitum on Fusarium oxysporum f. sp. phaseoli causing wilt disease in beans has been studied. The pathogen was completely engulfed by the hyphae of Trichoderma and treated seeds reduced the post-emergence death of seedling [29]. Another study observed that seeds of **Grass pea** treated with rhizobial inoculants resulted in significant effect in reducing the severity of foot and root rot up to 70.16% [16]. In this study , post-emergence death of plants was found to be decreased by treating seeds only BAU-Biofungicide with combination of BINA-Biofertilizer up to to 86.10% % over the control.Plant stand of the Grasspea have been found to increase due to the use of cowdung, BINA-Biofertilizer and BAU-Biofungicide either alone or in combination. Among the treatments BAU-Biofungicide increased plant stand of grasspea up to 30.60 %, respectively over control, which was followed by BINA-Biofertilizers. Bhuiyan (2005) reported higher plant stand of some vegetables by upto 19.06% when seeds are treated with BAU-Biofungicide [33].Application of cowdung in the soil and use of BINA-Biofertilizer and BAU-Biofungicide as seed treating biocontrol agent and growth promoter resulted higher shoot length, root length, fresh and dry shoot weight and root weight, number of nodule/plant and weight of nodule/plant over control. This study is in accordance with the findings of Singh et al. (1997) who recorded mycoparasitism of Trichoderma against the chickpea wilt, Fusarium oxysporum and plant become healthy and growth of chickpea roots, shoots and leaves was enhanced[36].Hossain and Shamsuzzaman (2003), and Shamsuzzaman (2003) found that application of BAU-Biofungicide seed treating agent resulted higher shoot length of sweet gourd. [37].Kibria and Hossain (2004) reported that seed treated with Biofertilizer and Rhizobial strain resulted in up to 8.45% higher shoot length over untreated an increased number of nodule/plant 58.4%. [37].Yeasmin (2004) reported that use of BINA-Biofertilizer and BAU-Biofungicide as seed treating biocontrol agent and application of

cowdung in soil as a organic source of nutrient resulted higher shoot length, root length, shoot weight, root weight and vigour index. [39].Hossain and Naznin (2005) and Bhuiyan (2005) reported that use of BAU-Biofungicide as seed treating agent resulted an increase of shoot length, root length, shoot weight of the vegetable seedlings. [40].Shoresh et al. [24] who recorded mycoparasitism of Trichoderma against the chickpea wilt caused by F. oxysporum and found that the plant becomes healthy and the growth of chickpea roots, shoots, and leaves was enhanced. Application of Trichoderma as a seed-treating agent resulted in higher shoot length, root length, and shoot weight of vegetable seedlings [12, 13, 21]In another experiment, it has been found that Mung (Vinga radiata L.) seed inoculation with rhizobium increased nodulation (in terms of their number and dry weight), over the control [23]. Biomass production of grasspea have been found to be increases due to use of cowdung, BINA-Biofertilizer and BAU-Biofungicide either alone or in combination with each other. Among the treatments use in the present study, BAU-Biofungicide treated seed resulted higher. Biomass production of grasspea by 36.10%, respectively. This finding also supported by]. Sharma et al. (1995) noted that the Mung (Vinga radiata L.) seed factorization with rhizobium increased nodulation (in terms of their number and dry weight), over the control [41]. Sultana and Hossain (1999), [42].It has clearly pointed out that BAU-Biofungicide either alone or in combination with cowdung and Biofertilizer can successfully be used for successful cultivation of grasspea.

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