Comparative Field Performance Analysis Of Three Varieties of Mungbean (*Vigna Radiata* L)

B.Sc Honours (Project)

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Dedicated

To

My Respectable parents

and

Honorable Supervisor

ACKNOWLEDGEMENT

I wish to acknowledge the immeasurable grace and profound kindness of Almighty Allah, the supreme ruler of the universe, who enabled me to make a successful completion of the research and submission of the dissertation. I would like to express my profound sense of gratitude and appreciation to my respected teacher and supervisor Dr. Rafiul Islam, Professor, Department of Botany, University of Rajshahi for his kind and constant supervision during the course of this investigation. His inspiring guidance, cordial behavior, encouragement, perseverance and affection during the research work made this Project. I am grateful for his intellectual and potential supervision.

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The Author

CERTIFICATE

This is to certify that the work presented in this dissertation entitled **"Comparative Field Performance Analysis Of Three Varieties Of Mungbean*(Vigna Radiata)*"** is based on the work carried out by the examination Roll No. 09086417 under my supervision in the Department Botany, University of Rajshahi and the Project paper is suitable for submission as to the style and contents, for the partial fulfillment of the degree of B.Sc Hon's in Botany.

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Abstract

In the present work of Mungbean is used for research materials. Three varieties of Mungbean named BINA-8, BARI-6, BINA-5. are used for it. We cultivated the varieties in three upazilla in Rajshahi named paba, Baraigram, Patnitala in Kharif season after Analysis the Data we found that BINA-8 is the most suitable variety for the farmer.

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Chapter-1

1.1 Introduction

Mung bean (*Vigna radiata L.* Wilczek) known as green gram is one of the most important pulse crop all over the world. It is cultivated most extensively in India, Myanmar, Bangladesh, Sri-Lanka, Pakistan, Thailand, Philippines, China, Japan, Korea, Iran, Indonesia, parts of East and Central Africa, West Indies, USA and Australia. The genus *Vigna* currently includes around 80 species distributed throughout the tropics (Pasquet, 2001).

1.2 Importance of Mung bean

This crop is regarded as quality pulse in Bangladesh for its excellent protein quality (20-28.4%), high digestibility and freedom from flatulent effects associated with other pulses e.g., chickpea and lentil. (Hoque *et al.,* 2007). Among the pulses in Bangladesh, mungbean ranks 5th in acreage and production and first in market price (BBS, 2008). The average production of mungbean in Bangladesh is about 652.08 kg ha-1 which is lower than that of India and some other countries of the world (BBS, 2008). In Bangladesh, it is used as whole or split seeds as Dal (soup) but in many countries sprouted seeds are widely used as vegetables.

Table number 1.1 (Nutritional qualities of Mung bean)

Nutritional value per 100 g (3.5 oz.)

Component	Quality
Energy	1,452 kJ (347 kcal)
Carbohydrates	62.62 g
- Sugars	6.6 g
- Dietary fiber	16.3 g
Fat	1.15 g
Protein	23.86 g
Thiamine (vit. B_1)	0.621 mg (54%)
Riboflavin (vit. B_2)	0.233 mg (19%)
Niacin (vit. B_3)	2.251 mg (15%)
Pantothenic acid (B_5)	1.91 mg (38%)
Vitamin B_6	0.382 mg (29%)
Folate (vit. B_9)	625 µg (156%)
Vitamin C	4.8 mg (6%)
Vitamin E	0.51 mg (3%)
Vitamin K	9 µg (9%)
Calcium	132 mg (13%)
Iron	6.74 mg (52%)
Magnesium	189 mg (53%)
Manganese	1.035 mg (49%)
Phosphorus	367 mg (52%)
Potassium	1246 mg (27%)
Zinc	2.68 mg (28%)

1.3 Objectives

The objectives of this study are:

1. To evaluate the yield performance of three popular Mung bean varieties through multi location yield trail.
2. To select the superior cultivar of Mung bean that show better performance in drought proves barind and ecosystem.

Chapter-2

2.1 MATERIALS & METHODS

i) Materials

In the present investigation pulses are used for plant materials. The variety for the experiment given below...

ii) Mung bean cultivars

Three Mung bean cultivar namely:

BARI (Bangladesh Agricultural Research Institute)-6

BINA (Bangladesh Institute of Nuclear Agriculture)-5

BINA(Bangladesh Institute of Nuclear Agriculture)-8

iii) Source (SAFBIN project, CARITAS Rajshahi regional office)

2.2 Methods

i) Experimental site

The experiment was set at the Paba, Patnitala and Baraigram Upazila.

ii) Seed rate

40 kg / ha for line seeding; 45-60kg/ha for broad casting if grown after wheat harvest. In potato field Mung bean seed will be just half of the recommended dose.

iii) Time of seeding (kharif-1)

21 Feb. to 15 march

iv) Fertilizer dose

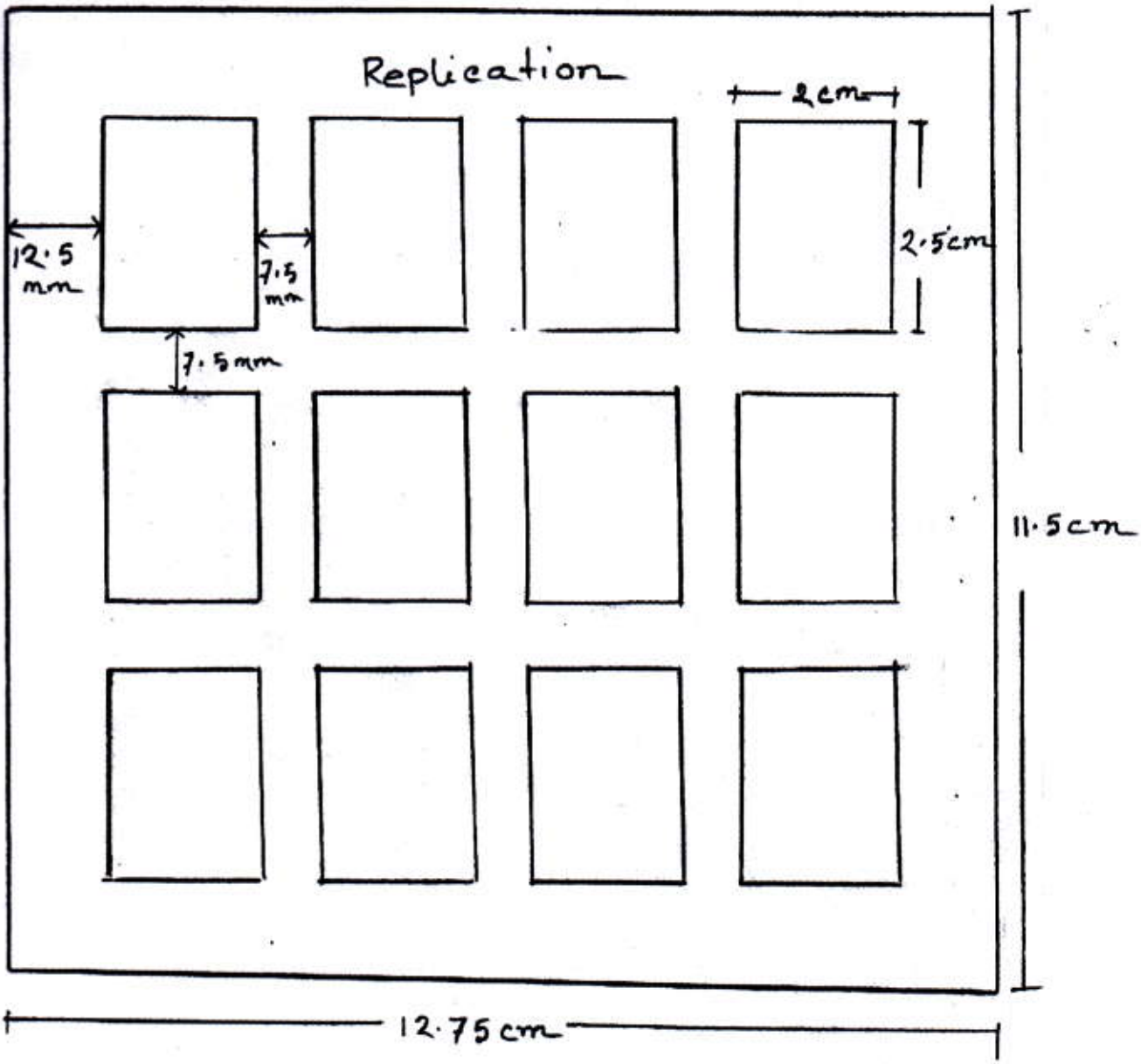
Urea: 40kg/ha, TSP: 80/ha, MOP: 30kh/ha (in potato field no fertilizer is required).

v) Preparation of the Experimental Field

The experimental field was ploughed 4 times repeatedly. Weeds were removed completely before layout of the field and sowing of the seeds. Thus prepared the experimental field was ready for sowing the seed.

vi) Field Design

Layout of the experimental field (Randomized Complete Block design) was used



REVIEW OF LITERATURE

Pawan K. Jaiwal and Anju Gulati

(1) Department of Bio-Sciences, M.D. University, and 124001 Rohtak, IndiaReceived: 27 September 1994 accepted: 20 June 1995Summary Mungbean is an important source of vegetable protein for the growing population in many developing countries of South East Asia. Its production is limited due to its susceptibility to diseases and insect pests besides many other undesirable agronomic traits. Strategies for increasing and stabilising its production have been to develop varieties resistant to diseases, pests and with other desirable agronomic traits. Genetic improvement of this crop by classical breeding has met with limited success due to the lack of sufficient and satisfactory level of genetic variability within germplasm. Recent advances in biotechnology have offered the opportunity to develop new germplasms. The development of such technologies largely depends on efficient regeneration of sexually mature plants from organs, tissues and protoplasts. An overview of plant regeneration by direct or indirect organogenesis and embryogenesis is presented. The use of *in vitro* and molecular Techniques such as somaclonal variation, screening for various desirable traits, interspecific crossing and genetic transformation to supplement conventional breeding, for genetic improvement of this crop is described. The advantages and limitations of these techniques along with directions for future research are discussed.

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A hydroxyproline resistant (Hyp[r]) callus line of Vigna radiata (L.) Wilczek has beenisolated as a spontaneous variant, on agar solidified PC-L2 medium supplemented with 10 mm hydroxyproline (Hyp), a concentration lethal to wild type cells. The selected clone contained higher endogenous level of free proline and K[+]. The stability of selected trait was determined by growing it on normal medium for 3 months and then bringing back it on the Hyp-containing medium. This cell-line grew well on medium containing 10 mmHyp and still contained more proline and K[+] than the wild type. Hyp[r] callus line showed better tolerance to exogenously supplied NaCl in the medium than the normal sensitive callus line Anju Gulati and Pawan K. Jaiwal Abstract An osmotically (mannitol) tolerant callus line of *Vigna radiata* (L.) Wilczek has been isolated from callus cultures grown on

modified PC-L2 medium supplemented with increasing concentrations of mannitol. The tolerance was stable and retained after growth in the absence of mannitol selection for 2 months. The growth of the tolerant line, in the presence of mannitol (540 mol m-3) was comparable to that of a sensitive callus line growing in the absence of mannitol. This line not only grew well on media containing up to 720 mol m-3 mannitol, but also required 450 mol m-3 mannitol for its optimal growth. Osmotically tolerant callus also showed increased tolerance to NaCl (0–250 mol m-3)stress as compared to sensitive callus. Accumulation of Na+ was lower, and the level of K+was more stable in osmotically tolerant than in sensitive calli, when both were exposed tosalt. The free proline content of both tolerant and sensitive calli increased on mediasupplemented with mannitol or NaCl. However, the proline content of sensitive callus washigher than in tolerant callus in the presence of same concentrations of mannitol or NaCl

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Conditions for plant regeneration from excised cotyledons of *Vigna radiata* were studied.Complete plant developed from the uncallused proximal ends of cotyledons on Murashige & Skoog's (MS), Gamborg's (B5) and (MS salts + B5 vitamins) basal media. The basal medium was found to be best for plant regeneration. Regeneration frequency, however, varied with genotype, size, orientation and age of explant and the different plant growth regulators combination in the medium. Addition of cytokinins induced callusing at the proximal ends of cotyledons followed by multiple shoot formation. Out of 6-benzyl aminopurine (BAP), kinetin (KIN), N (isopentyl) adenine (2iP) and adenine sulphate (AS), only BAP and KIN were found to be more effective in enhancing the frequency of shoot regeneration. BAP at 1×10-1M induced maximum (60%) shoot regeneration whereas maximum number of shoots (8 to 9 shoots) per explant was observed with 5×10-6M BAP. Cotyledons excised from two-day old seedlings were most regenerative. The regenerative response of cotyledons decreased when sliced into two equal parts either longitudinally or transversely. Callusing and organogenic differentiation occured only if the petiolar end of cotyledons was in contact with medium. None of the tested treatments were effective in inducing shoot bud differentiation from subcultured callus. Well-developed shoots rooted when incubated on half strength MS, MS and MS basal medium

supplementedwith IAA (5×10-6M). The rooted plants were transferred to pots and later established in the field with 60% success.

Mohsin, Naqvi

applied auxins, both IAA and 2,4-D, during the *Received 12 January 2007, accepted 28 March 2007.*

The phytohormone auxin is critical for plant growth and orchestrates many developmental processes. Present research was conducted to investigate the effect of auxins, IAA and 2,4- D, on the growth profile of *Vigna radiata* (Mung bean) seedlings. For this purpose, two hydrolytic enzymes, viz. invertase and amylase, known to play key role in early growth processes, were selected. Exogenous IAA at a concentration of 10 µM and 100 µM and its synthetic version 2,4-D at a concentration of 0.001 µM were supplied to the incubation medium carrying 3-days old seedlings, and shoot tissue was excised following incubation of 1, 3, 6 and 12 hours respectively. Invertase activity increased in response to first hour of incubation only. The rest of the period was marked by a gradual decrease, which lasted up to 12 hours. Response of amylase to applied auxins followed nearly the same pattern as that of invertase being induced by both IAA concentrations and by 2,4-D during the first hour. As incubation period was increased from 3 to 12 hours, IAA continued to inhibit the enzyme activity while a second inductive peak at 6 hours was noted uniquely for 2,4-D. It is concluded that growth of intact seedlings of Mung bean is stimulated by externally supplied auxin. Reduction of responsiveness to auxin that follows prolonged application suggests a slow adaptive regulation by auxin itself.

SUMITHRA K. ; JUTUR P. P. ; CARMEL B. Dalton ; REDDY Attipalli R. ;

The influence of increasing salinity stress on plant growth, antioxidant enzymes and proline metabolism in two cultivars of Vigna radiata L. (cv. Pusa Bold and cv. CO 4) was investigated. Salt stress was imposed on 30-days-old cultivars with four different concentrations of NaCl (0, 100, 200 and 300 mM). The roots and shoots of CO 4 showed greater reduction in fresh weight, dry weight and water content when compared to Pusa Bold with increasing salt stress. Under salinity stress, the roots and shoots of CO 4 exhibited higher Na[+]: K[+] ratio than Pusa Bold. The activities of reactive oxygen species (ROS) scavenging enzymes and reduced glutathione (GSH) concentration were found to be higher in the leaves of Pusa

Bold than in CO 4, whereas oxidized glutathione (GSSG) concentration was found to be higher in the leaves of CO 4 compared to those in Pusa Bold. Our studies on oxidative damage in two Vigna cultivars showed lower levels of lipid peroxidation and H[2]O[2] concentration in Pusa Bold than in CO 4 under salt stress conditions. High accumulation of proline and glycine betaine under salt stress was also observed in Pusa Bold when compared to CO 4. The activities of proline biosynthetic enzymes were significantly high in Pusa Bold. However, under salinity stress, Pusa Bold showed a greater decline in proline dehydrogenase (ProDH) activity compared to CO 4.Our data in this investigation demonstrate that oxidative stress plays a major role in saltstressedVigna cultivars and Pusa Bold has efficient antioxidative characteristics whichcould provide better protection against oxidative damage in leaves under salt-stressedconditions. Abdel Haleem M.A. MohammedPot experiment was carried out to determine the effect of salt stress (NaCl 0.0, 100,200and 300 mM) on growth and metabolic activities of mungbean plants. Pre-soaking theseeds in GA 3(200 mg/L) was shown to a meliorate the deleterious effects of salinity in the majority of cases. The results revealed that, NaCl treatment induced drastic reduction in growth characteristics of mungbean plant through decreasing the shoot and root lengths, number of lateral roots and number of leaves, total area of leaves as well as fresh and dry weights of shoot and root of mungbean plants. Furthermore, this treatment markedly decreased the pigment contents, photosynthetic activity, reducing sugars and sucrose contents as well as total soluble-N, total-N and protein-N contents, nucleic acids content, peroxidase and catalase activities and rate of respiration as O 2 uptake and CO 2 evolution. On the other hand, salt stress appeared to increase polyamine (putrescine PUT, spermidine Spd, spermine Spm and total polyamines, RNase and polyphenol oxidase activity. Moreover, salt stress increased sodium and chlorine contents and decreased potassium, calcium and magnesium levels in root and shoot of mungbean plants. In the majority of cases pre-soaking the seeds in 200 mg/L GA 3 caused partial decrease in the deleterious effects of salinity in all parameters of this study.

SUSAN EAPEN

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Mesophyll and hypocotyl protoplasts were isolated from *Vigna radiata* using a Combination of Cellulase Onozuka RIO (1%) and Macerozyme (0·2%). On a modified V- 47 medium, 60% of the cultured protoplasts divided and developed into colonies. Protoclones differentiated roots on MS medium supplemented with different auxins and cytokinins; however, shoot differentiation was not obtained. Co-cultivation of protoplasts with wild and shooter mutants of *Agrobacterium tumefaciens* did not lead to differentiation of plantlets. Lysopine and nopaline dehydrogenase were not detected in any of the selected protoclones. *Vigna radiata*, Mungbean, *Agrobacterium tumefaciens*, co-cultivation, protoplasts.

Chapter-3

Results & discussion

3.1 The techniques of analysis of data

01.Mean

02.Anova

03.Test of significant

Data

bari-6 grain/pod

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	12	13	12	12	10	12	13	11	12
patnitala	12	14	13	12	12	11	14	11	12
baraigram	12	12	12	10	11	11	12	12	12

bari-6 TGW(g)

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	43	43	45	39	39	38	43	42	38
patnitala	35	33	39	33	36	36	35	33	33
baraigram	37	56	36	40	40	34	39	40	43

bari-6 (yield/ton/hactre)

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	0.4	1.8	0.5	1	0.8	1.8	0.55	0.7	0.8
patnitala	1.1	0.625	1.25	0.85	1.2	0.96	1.12	0.75	1.9
baraigram	1.425	1.4	1.67	1.7	1.45	1.68	0.675	1.6	1.025

BINA-5
grain/pod

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	13	11	10	14	10	10	10	11	12
patnitala	14	13	12	13	12	12	11	12	14
baraigram	14	12	10	12	12	11	10	12	11

BINA-5
TGW(g)

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	39	42	42	42	40	45	43	40	41
patnitala	35	35	35	35	35	35	34	36	34
baraigram	38	38	35	36	37	39	35	42	35

BINA-5
(yield/ton/hactre)

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	0.8	0.255	0.45	1.8	0.7	0.28	0.25	1	0.8
patnitala	2.4	0.9	1.67	1.4	0.75	1.2	0.5	1.37	0.75
baraigram	1.55	1.275	1.86	1.7	1.62	1.34	1.65	1.625	1.13

BINA-8
grain/pod

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	12	13	12	12	13	11	12	12	12
patnitala	15	12	12	14	14	12	15	13	13
baraigram	12	10	12	11	13	12	12	12	12

BINA-8
TGW(g)

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	42	42	42	40	41	40	42	42	42
patnitala	36	35	36	35	37	35	36	42	36
baraigram	37	32	34	26	36	37	35	36	33

BINA-8
yield/ton/hactre

location	R1	R2	R3	R4	R5	R6	R7	R8	R9
paba	0.5	2	1.5	0.3	0.5	0.5	0.5	2	2
patnitala	0.97	1.1	1.5	0.575	1.125	1.125	1.6	2.2	2.2
baraigram	1.8	0.825	1.4	1.125	1.19	1.19	0.97	1.43	1.3

Table: 1 Yield Performance of three varieties of Mungbean under three location

Location	Variety	Range	Mean ± SE	CV%
Paba	BARI-6	0.4-1.8	0.67±0.286	127.67
	BARI-5	0.25-1.8	0.70±0.16	68.82
	BARI-8	0.3-2	0.86±0.34	119.76
Patnitala	BARI-6	0.625-1.9	1.08±0.124	34.44
	BARI-5	0.5-2.4	1.21±0.19	47.10
	BARI-8	0.575-2.2	1.36±0.183	40.44
Baraigram	BARI-6	1.025-1.7	1.40±0.11	24.28
	BARI-5	1.13-1.86	1.52±0.028	5.26
	BARI-8	0.825-1.9	1.30±0.12	29.15

Table: 2. Analysis of Variance of yield (ton/hac) of three varieties of mungbean.

Source	df	SS	MS	F value
Replication	2	0.532	0.266	3.8836
Variety	2	0.189	0.094	1.3763
Location	2	2.709	1.355	19.7706
V×L	4	0.479	0.120	1.7462
Error	16	1.096	0.069	
Total	26	5.004		

Coefficient of Variation: 25.05%

LSD (5%): 0.25459

LSD (1%): 0.344118

Result

Three popular Mungbean varieties BARI-6 ,BINA-5 and BINA-8 were cutlivated in three different locations. Paba (Rajshsahi District), Patnitala (Naogaon District) and Baraigram (Natore district) in RCBD with three repliction. the data on grain yield (Metricton/hac) was recorded after the crop harvest. The results of grain yield performance of three Mungbean cultivers are presented in table-1 and ANOVA is present in Table-2.

The results present table-1 Show that the grain yield ton/hec was found to vary with Mungbean cultivars and locations where they were being cultivated. The grain yield was found to vary significantly among the three Mungbean cultivars (Table-2). Among the three cultivars the CV. BINA-8 was found to show the highest grain yield. which is followed by BARI-6 and BINA-5 The BINA-8 showed the highest yield in Patinitala upozilla and the lowest yield in Paba upozilla. Therefore, it indicate that BINA-8 is not suitable crop in Paba but favorable in Patnitala upozilla. On the other hand the BINA-5 showed the highest crop yield in Baraigram upozilla and also the lowest Paba upozilla.

In case of BARI-6 the highest yield was recorded in the upozilla Baraigram and the lowest in Paba.

These results reveals that the Baraigram area is suitable to the cultivation of BINA-5 and BARI-6 On the other hand Patnitala and Paba area is suitable for growing BINA-8. Analysis of variance shows that the item variety, location, variety x location. The replication is also found significant which shows that the soil heterogeneity among the replicated plots.

DISCUSSION

Crop production is a complex process. It includes the function of soil, climate, planting and management all of them together. A proper management of these factors may give higher yield. Among the various factors influencing crop growth, soil moisture is one of the most essential one. It influences plant growth and development in various ways. Like any other crop, growth and yield of Mungbean is under control of many environmental factors and soil moisture is one of these factors. Plants are not equally sensitive to soil moisture stress at various stages of growth.

A proper water budget for the crops requires a good knowledge of water requirement of crops. A review of the water requirement varies mainly with the length of vegetative period. The yield response to irrigation, water depends mainly on proper irrigation scheduling.' Irrigation scheduling based on growth stages does not always meet the water requirement of the crop properly. It may result in over irrigation sometimes and under irrigation in others and in both cases yield of the crop is affected (Rashid and Islam, 1986).

In the present investigation the results show that the plant height was significantly higher in all the growth stages under well-watered plants than that of the water-stressed plants. Similar result was observed by Bhati and Rathor (1982) and chaniara and Damor (1982) in mustard. Mannan, *cl al.* (1992); Morales and Carangal (1981) and Domingo (1981) in mungbean and El Nadi (1969) in beans observed similar trend of results. Hiler *cl al.* (1972) also observed less plant height in cowpea due to severe drought at all the stages of growth.

The harmful effects of drought are generally more pronounced in stages of growth and development like crown root initiation stage or heading stages where plants have a greater sensitivity to water stress. However, all the physiological process are not equally reacted by sill moisture stress (shaw and Laing, 1968). Under drought the plants become metabolically inactive and the photosynthesis and production of dry matter become practically nil. These effects are primarily attributed by the leaf. Soil water stress reduces the expansion and final size of the leaf and all these can be measured by leaf area parameters (Rahman *cl al.,* 2001; Yadav *cl a/.,* 2003 and Sivakumar and Shaw, 1978).

After germination, Leaf number increases very slowly at first for a long period and it follows a period of rapid expansion with variation in total leaf area of a plant due to the change in number of leaf and size of leaf per plant. The number of leaf present at a particular time is equal to the total number of leaves produced minus member of leaves that have been lost by abscission. The numbers of leaf is dependent on number of nodes, which is governed by the time during which leaves are produced and also by survival of the leaf. Finally, leaf size is determined by the number and size of cells of which a leaf is built (Paul *ct at;* 2002 and Haider and paul, 2003).

In the present study the result shows that the average leaf area was higher in the well-watered plants than that of the water-stressed plants at all the stages of growth. Similar result was reported in sunflower and soybean (Cox and Joliffe, 1987), in peanut (Nageswara Rao *el ai,* 1988), in barley (Kirby, 1969). The increase of leaf area occurred due to increase of leaf expansion. Total leaf area of plant may be varied due to change either in leaf number or teaf size (Arnon, 1975). Ahmed (1988) also found lower

number of leaves at 20% of plant available water in bathuas at the three stages of growth.

In the present experiment soil moisture had significant effect on total dry matter. The well-watered plants produced significantly higher total dry matter than the water-stressed plants. Similar result was reported by (Nagarajah and Schutze, 1983); Mondal and Paul, 1994; Begum and Paul, 1993) in mustard, (Kirby, 1969) in barley, (Sivakunar *el al.,* 1979) in sorghum. Total dry matter increased slowly at the vegetative stage, but increased rapidly with the advancement of the growth periods **Fig. 5.** The rapid increase of total dry matter at later stages was due to the continued increase in the stem and pod dry matter as leaf dry matter was declining (Allen *el al.*,1971; Scott *el al.,* 1973).

In the present investigations leaf, stem and penicle dry matter increased due to soil moisture. Similar results were reported in barley (Kirby, 1969), in mustard (Mandal *el al.* 1986; Singh *el al.* 1987; Haque *el al.* 1987; Begum and Paul, 1993; Mondal and Paul, 1994, 1995), in sorghum (Sivakunar *el al.* 1979). Total dry matter increased slowly at the early vegetative stages but increased rapidly with the advancement of the growth period.

Crop yield as a complex character depending upon a large number of morphological and physiological characters. In the present investigation, seed yield and most of the components of yield were affected by soil moisture.

Robins and Domingo (1962), Day and Intalap (1970) and Sairam *el al.* (1990) reported that grain yield of Mungbean were generally reduced by soil moisture stress.

The plants under irrigation showed better performance than the rainfed condition. Plant height, Extrusion length, 1000 grain weight, Total dry weight, vegetative weight, Grain yield (ton/hac) were higher in plants under irrigated condition . The above parameters were lower in non-irrigation condition. Similar results were reported in barley. In wheat EI-Nadi (1969), Destro *el at.* (2001) reported that plant height, dry weight and grain yield were higher in the favorable water regime treatments. EI-Rab *el al* .(1988). Murah (2001), Nyachiro *el at.* (2001), Rane and Nagarajon (2001) reported that water stress at different growth stages had a significant effect on grain and straw yields in yehcat. In correlation coefficient study of growth attributes of irrigated and rainfed plants, it was found that in case of irrigated plants, grain yield/plant was positively correlated with grain and negatively correlated with plant height, extrusion length, and grain number. All the growth attributes did not have any clear pattern. The result of the present study indicated that among the "three varieties BINA-8 performed better in respect of dry matter, growth attributes and yield in both the irrigated and rainfed conditions. So, it can be said that the variety, BINA-8 may be selected for further breeding programme for the grain yield Character.


বাংলাদেশ, ভারত ও নেপালের বৃষ্টি নির্ভর এলাকার ক্ষুদ্র কৃষকদের দক্ষতা
বৃদ্ধির মাধ্যমে জলবায়ু পরিবর্তনের সাথে খাপ খাওয়ানোর সক্ষমতা বৃদ্ধি
safbin
Caritas


BINA 7


BINA 8

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