Influence of Potassium Fertilizer Management on Growth, Yield, Yield Components and Fiber Quality of Three Cotton Varieties (*Gossypium hirsutum*

L.)

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7th July 2021

Introduction

Cotton is a principal fibre crop in

Myanmar. Myanmar commercially grown in :

- **Magway Region 47.83 %**
- **Mandalay Region 32.77 %**
- **Sagaing Region 14.32 %**
- **Western Bago Region 3.23 %**

(DOA, 2018)

2

2

Myanmar's cotton production ❖ Myanmar's

cotton production need -

to increase high yield and

- to improve fiber quality

(lint) ❖ Myanmar's

Textile Industry need

- to meet the qualitative standards prescribed

fiber (Santhanam, 1979)

3

Cotton production in central dry zone

❖ **In central dry zone, cotton producing constraint are:**

- ✔ **Agro climatic conditions**
- ✔ **Nutrient shortage**
- ✔ **Soil degradation and**
- ✔ **Irrigation**

❖ **The nutrient shortage is the most limited for cotton production**
(MCSE, 1995)

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Potassium requirement and Cotton

❖ **Cotton lint quantity and quality - depend upon availability of nutrients**

❖ **Potassium**

- a vital nutrient in cotton production

(Oosterhuis et al., 2003)

❖Cotton cultivation soils - low in available K

(Kerby & Adams, 1985)

Hypothesis

❖ The potassium fertilizer application influenced to increase yield and fiber quality of cotton in

central dry zone

Objectives

❖To know the information about nutrient managementpractices of cotton growing in

selected area

❖To evaluate the effect of potassium fertilizer application on plant growth, yield and yield components of cotton

❖To determine the influence of potassium application management on the cotton fibre quality

Experiment-1

Experiment-2

Experiment-3

Structure of study

Farmers' Nutrient Management Practices Survey

Effect of Different Rates of Potassium Fertilizer Application on Cotton Growth, Yield and Yield Components

Influence of Potassium Foliar Fertilizer Application on Fiber Quality and Nutrient Use Efficiency [8]

Experiment (1)

Potassium Fertilizer and Potassium Foliar Application Practices in

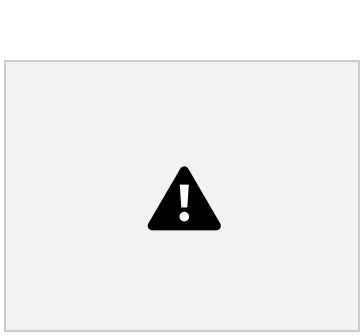
Cotton Production and

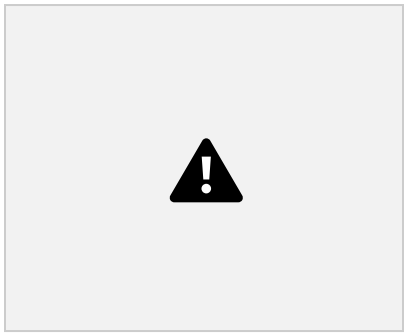
Farmers Perception in Myanmar

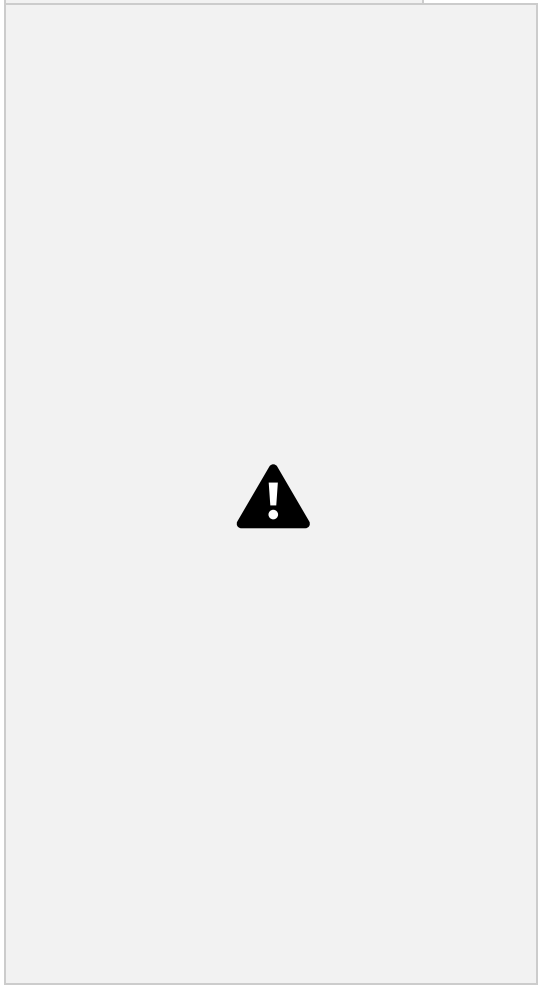
Objective

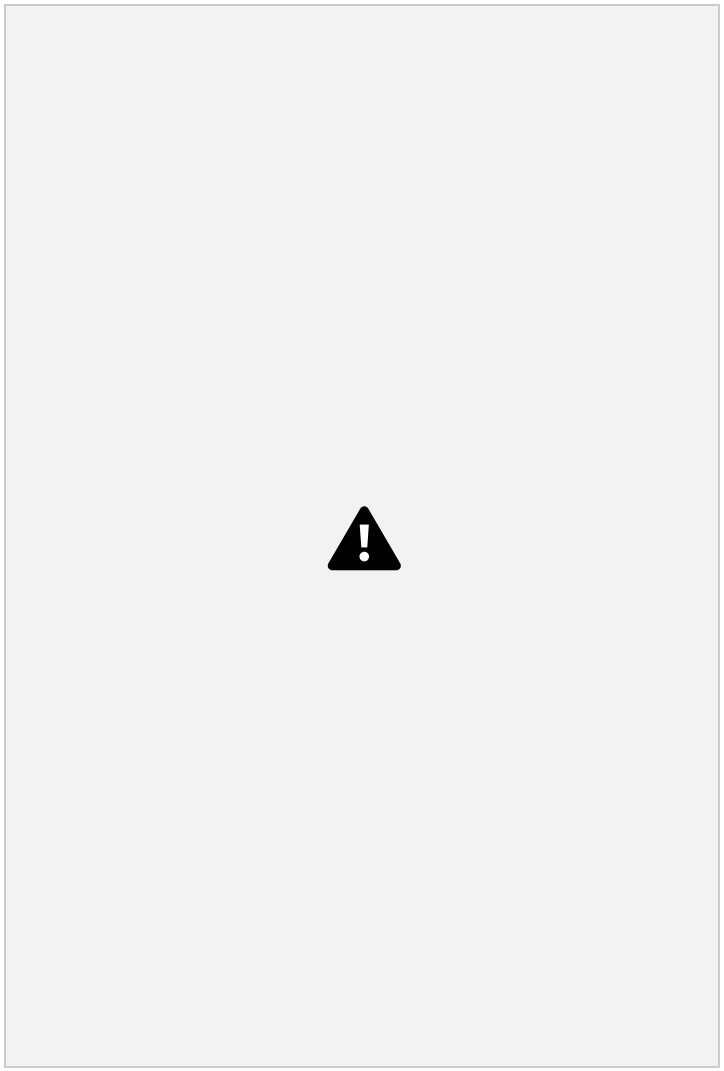
❖To know the information about nutrient

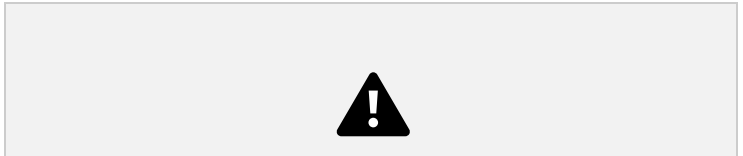
management practices of cotton growing farmers in Magway Region











Four Districts

1. Pakokku
2. Minbu
3. Magway
4. Thayet

❖ Dry zone site-

18° 50' to 22° 47' N

93° 47' to 95° 55‘ E

Figure.1 Survey sites in Magway Division [10]

Table. 1 Main study areas in Magway

Division Districts Township Village Pakokku

Pakokku Thanetaw Myaing Ooyinn

Magway Yenangyaung Kangye Myothit

Magyegone

Minbu Minbu Pytethin Salin Lapantaw

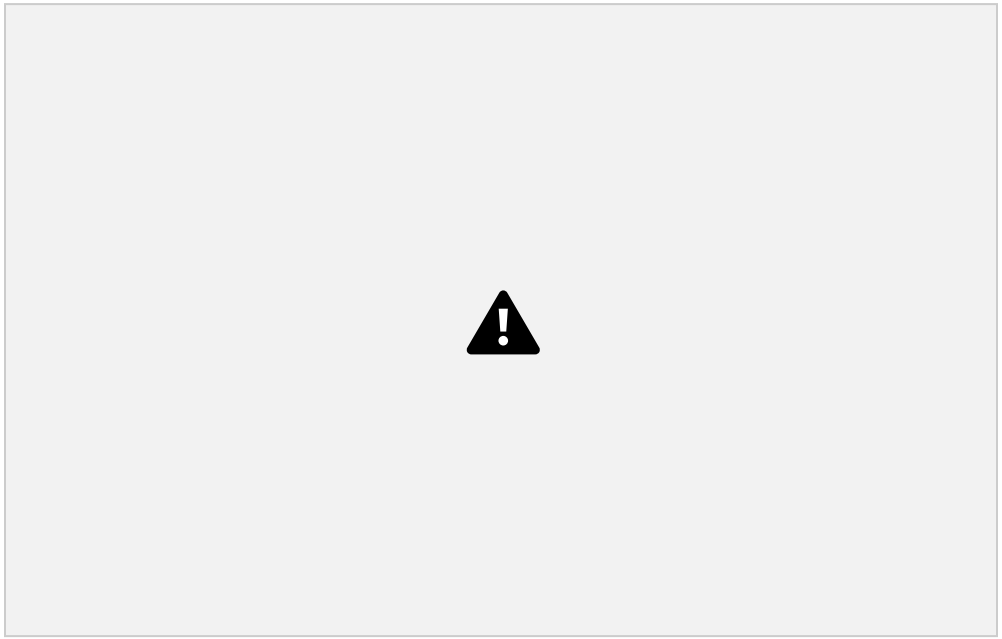
Thayet Thayet Htonetaung

Aunglan Yaepaw


11


Data Analysis

❖ **Survey data analysis of variance was performed by SPSS (version 23)**



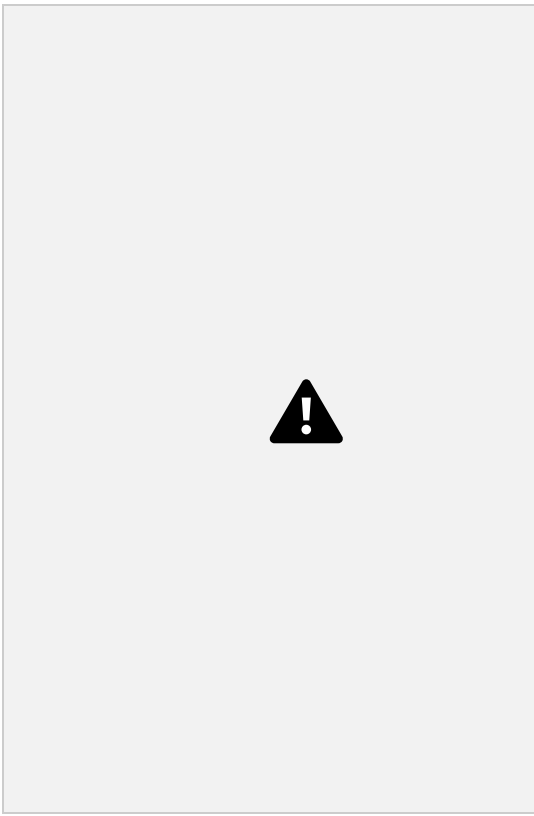


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Table. 3 Distribution of farmers' Fertilizer application practices in survey area

Characters Minimum Maximum Mean Std. Deviation

Cotton area (ha) 0.20 7.29 **1.59** 3.049 Yields (kg ha^{-1}) 161.34 3226.81

1280.88 210.263 Urea used (kg ha^{-1}) 3.71 370.50 **55.58** 0.482

Compound (kg ha^{-1}) 18.53 248.00 **92.63** 0.463 Apply of foliar (times)

1.00 7.00 **2.75** 1.590

Farm yard manure (ton ha^{1})

2.47 14.82 **6.66** 2.677  **13**

Table. 4 Area of varieties distribution in Survey Region

Variety % of grown cotton cultivation

Commercial name

Survey area Division area Country area

Ngwechi-6 *G. hirsutum* **55.00 55.10 43.36 Ngwechi-9** *G. hirsutum* 5.63

16.56 11.65 **Shwedaung-8** *G. hirsutum* **7.50** 1.49 **13.71**

Lungyaw-3 *G. hirsutum* 6.25 0 0 **Mahlaing war** *G. arboreum* 0.94

3.14 8.39

Wagyi *G. arboreum* 12.5 18.47 13.93  **14**

18.1

of

respondent
s %
40 30 20 10 0

0.6

31.9

6.3

0.6

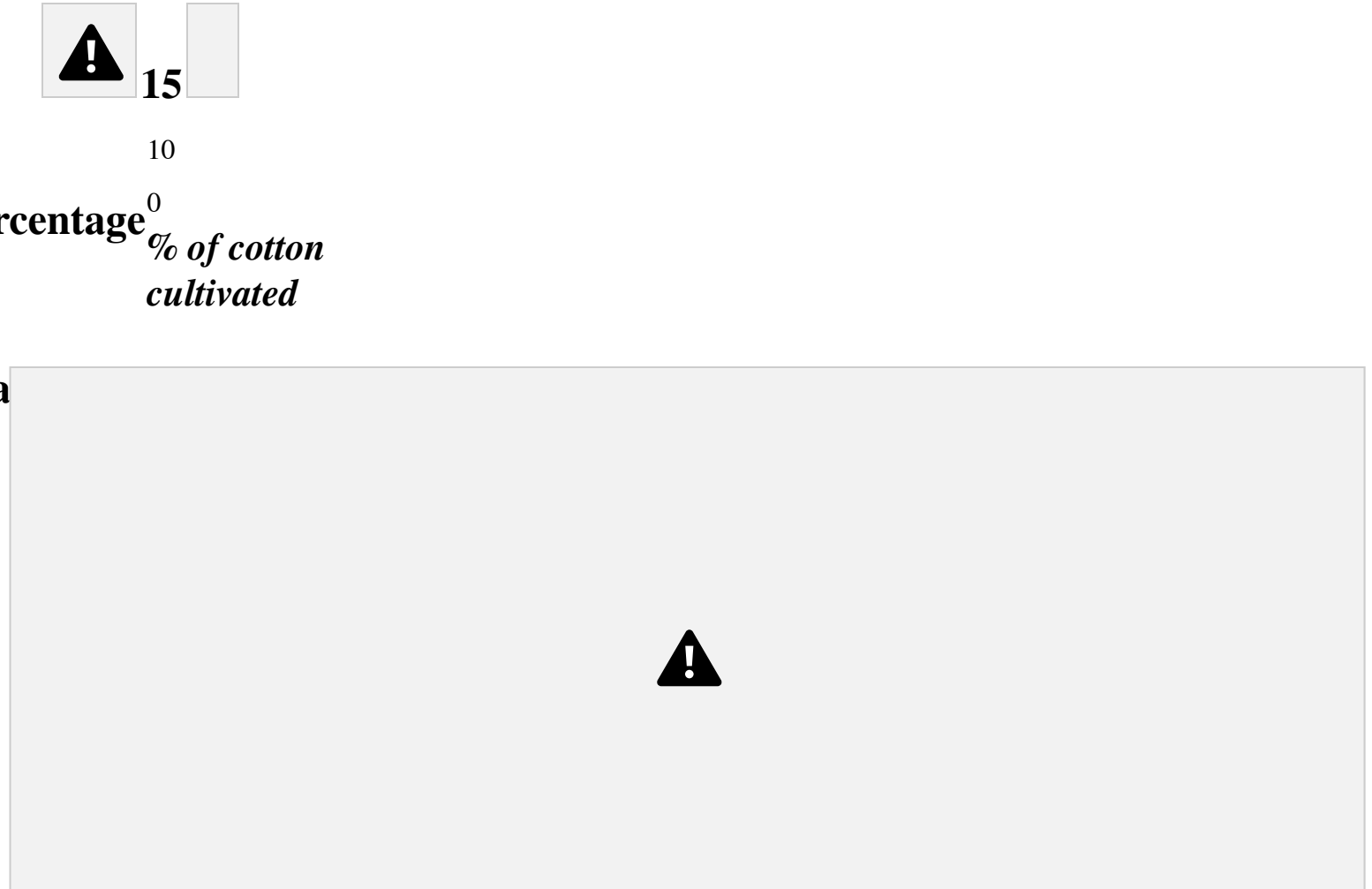
1.3

26.3

15

Frequencies of foliar fertilizer application

Fig. 2 Frequencies of foliar fertilizers application practices and percent of respondents in one cotton season



% of fertilizer using *% of urea using* *% of compound using* *% of foliar using* *% of FYM using*

Farmer's input management practices in survey area undo do

Fig .3 Farmer's perception of Fertilizers Management Practices in Survey Area

According to survey:

Varieties - Ngwechi-6

- Shwe Daung-8

mostly grown.

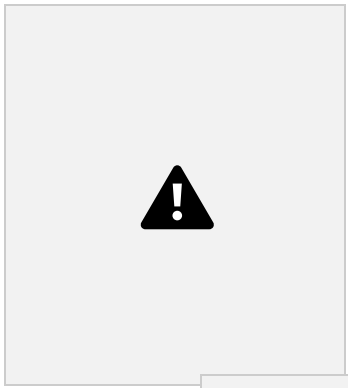
Fertilizers

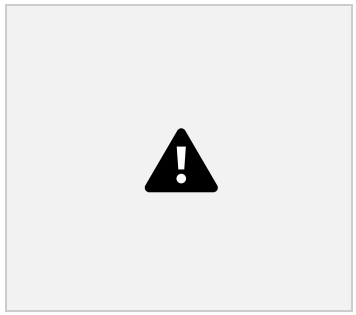
- no use straight potassium fertilizer but

- use in compound fertilizer

- Foliar fertilizer used, different system

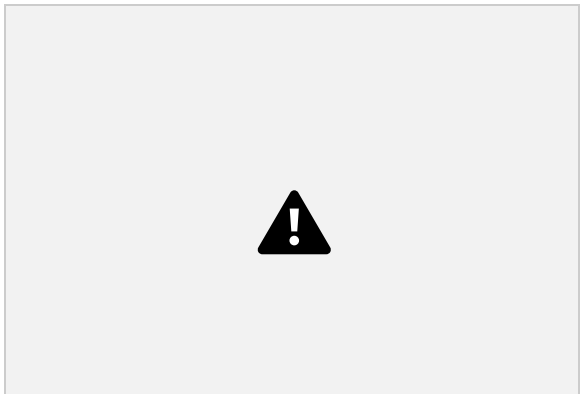
- Farm Yard Manure (FYM)

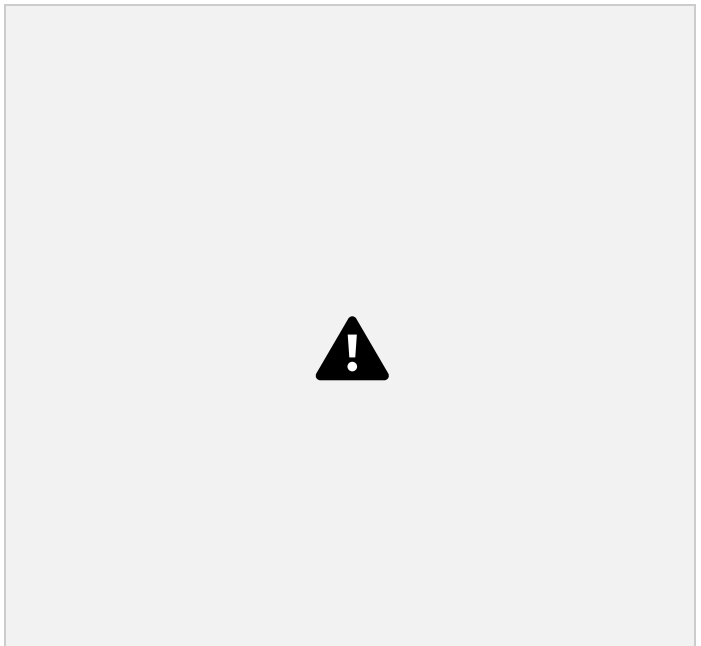




Experiment (2)

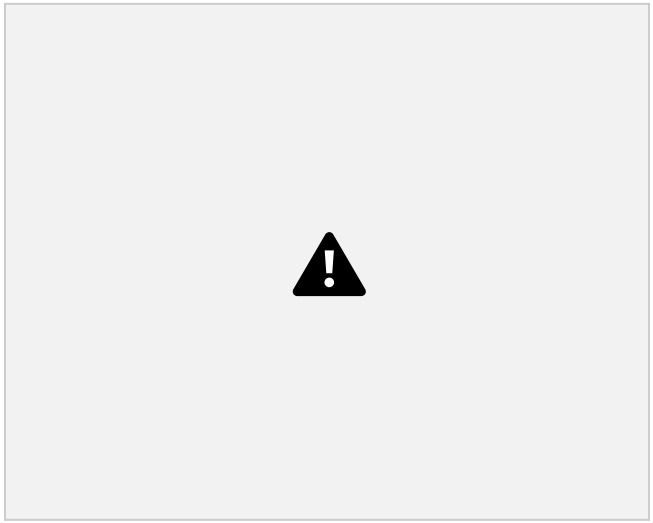
Influence of the Different Rates of Potassium Fertilizer Application on Cotton Yield, and Fiber Properties of Three Cotton Varieties

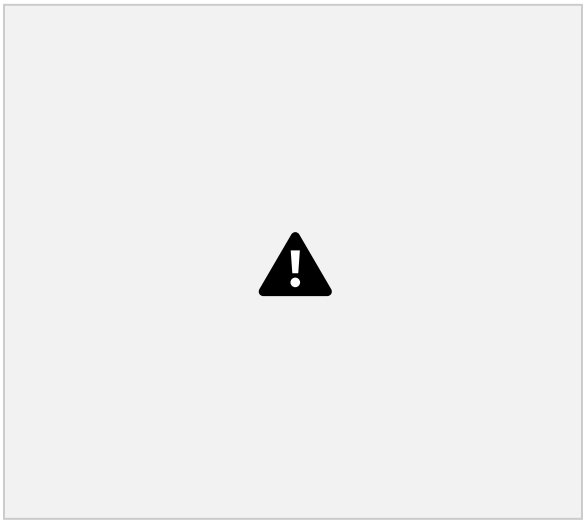


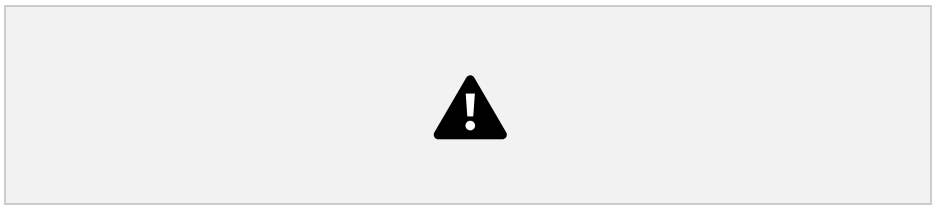


Objective

- To evaluate the effect of potassium fertilizer application on plant growth, yield and yield components of cotton







Material and

Method

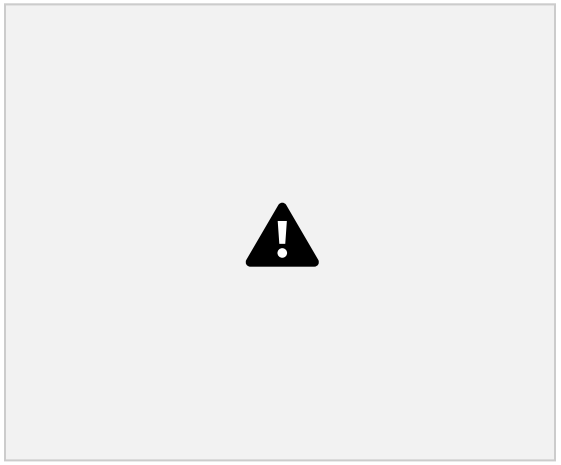
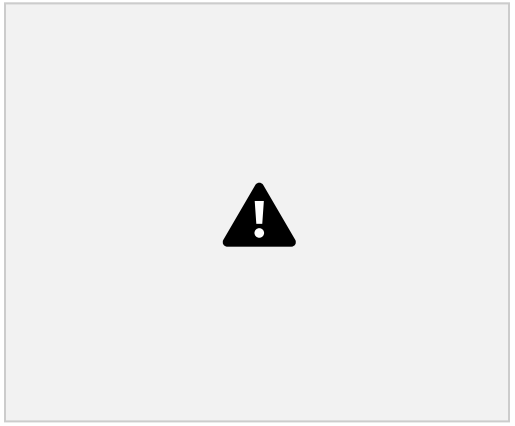
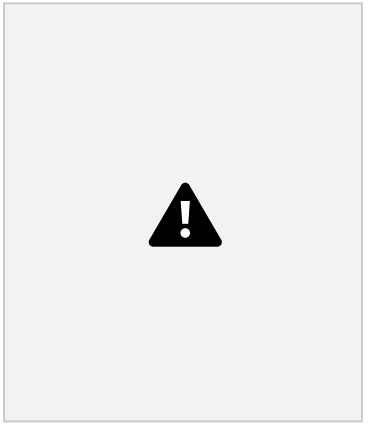
Experimental Site - Aunglan Cotton Technology Farm

Experimental Plot size - 4.5 m × 7.5 m

Spacing - 0.75 m × 0.75 m – 2 plants / hill Period - 2017

Post- monsoon (August - December)

- 2018 Post - monsoon (August - December)

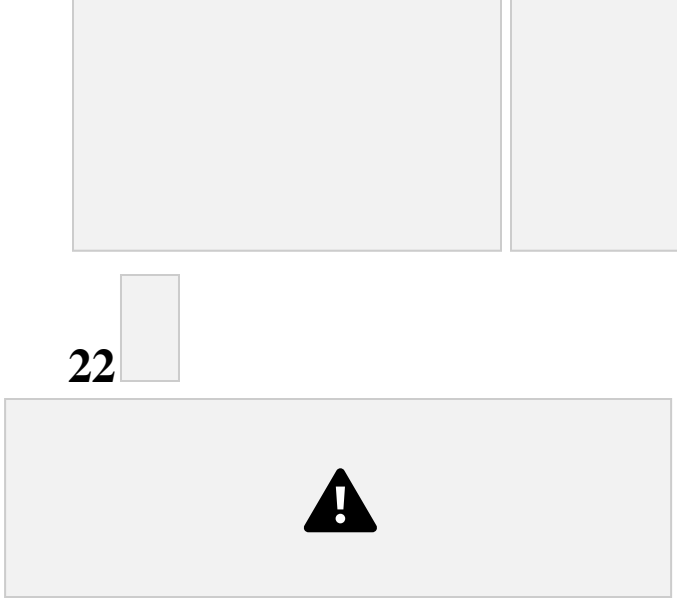




- Design - **Split-Plot**
- Replication - **3**
- Main plot - **Three varieties - Ngwechi - 6 - LGNC - 4 - Shwe Daung - 8**
- Subplot - **Five potassium fertilizer rates**

Treatments	kg K ha^{-1}	Application time	Basal	Squaring	Boll set
K_1	control	-	-	-	
K_2	30	25 %	50 %	25 %	
K_3	60	25 %	50 %	25 %	
K_4	90	25 %	50 %	25 %	
K_5	120	25 %	50 %	25 %	

Data Collection

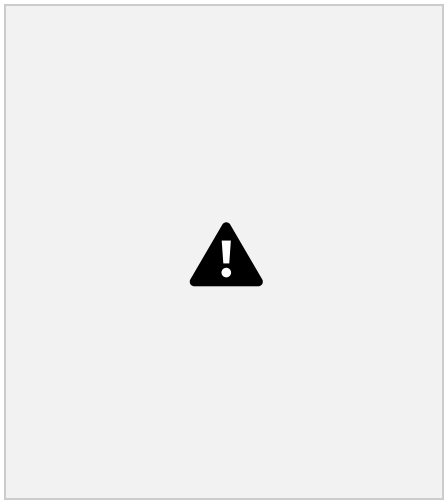
- Yield Component Parameters
- Yield
- Fiber Quality

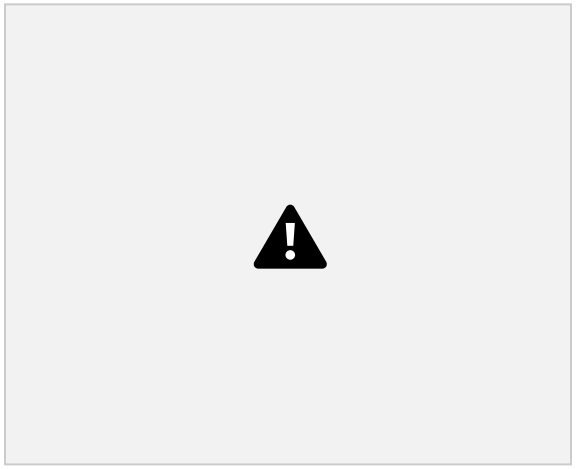


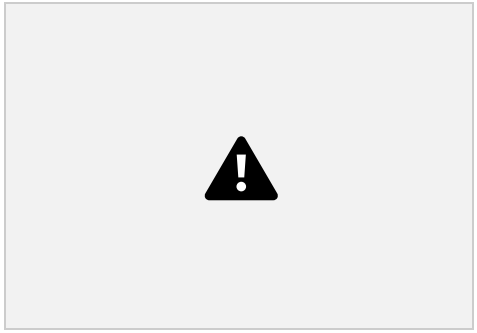
Data Analysis

- **Analysis of variance was performed by STATISTIX 8.**

❖ **Treatments means were compared with Least Significant Difference (LSD) at 5% level**







According to experiment 2:

K_4(90 kg K ha^{-1})

- highest boll weight
- higher seed cotton yield
- Lint yield in 2017

K_3(60 kg K ha^{-1})

- highest seed cotton yield
- lint yield in 2018

K fertilizer application Increase

- ❖ **higher fruit setting 8 - 19 %**
- ❖ **total bolls 7 - 14 %**
- ❖ **harvested bolls 17 – 28 %**
- ❖ **opened boll (%) 10 - 16 %**
- ❖ **Increase K- uptake 50- 106 %**

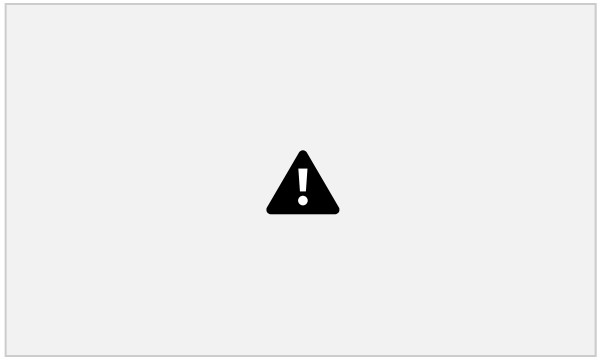
- ❖ **K_4(90 kg K ha^{-1})**

Highest Strength Counts

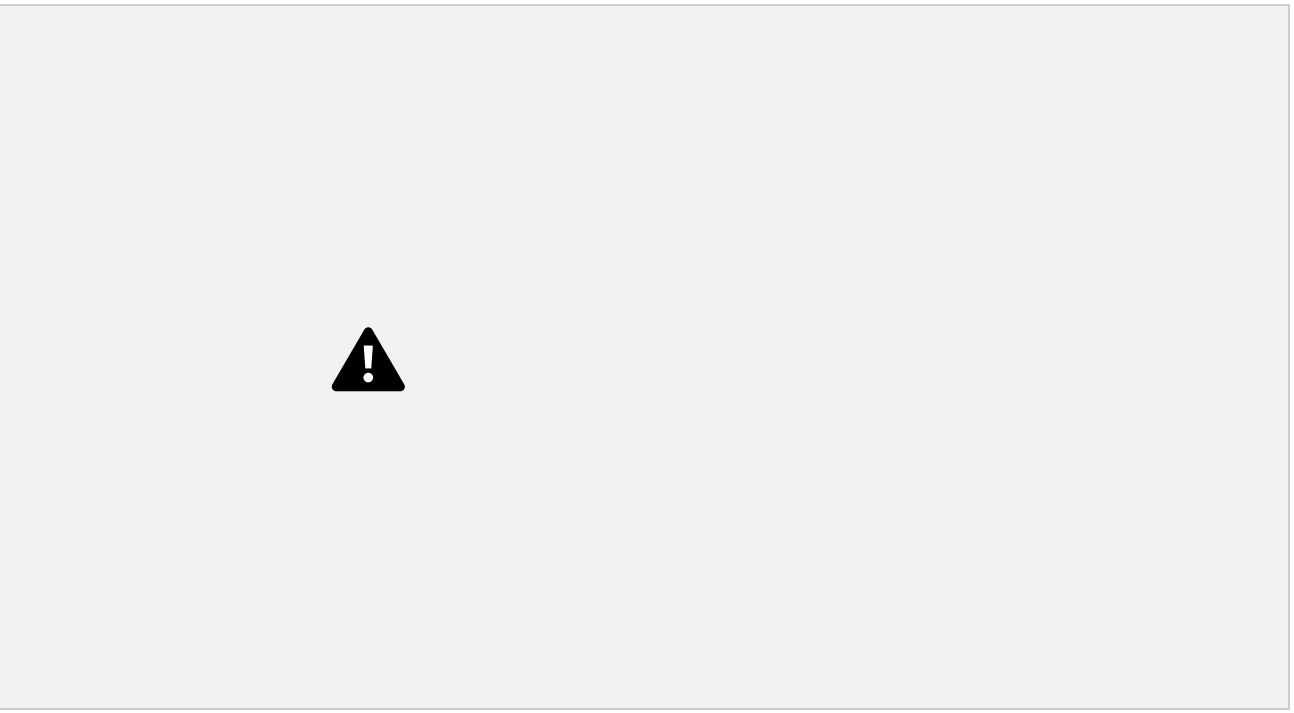
value + 9.17 % over the

control

Yarn strength 26



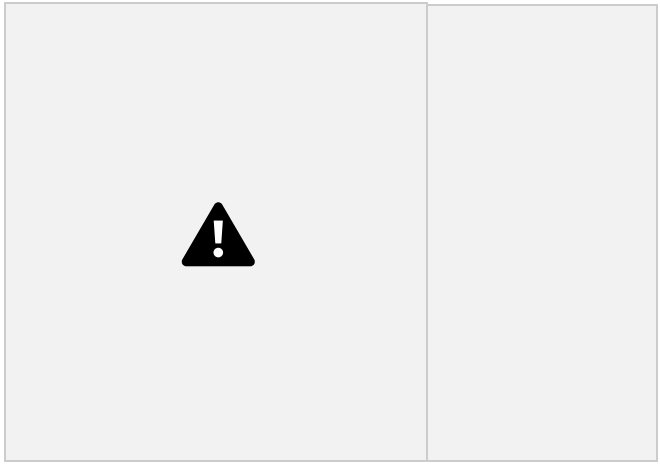
Wrap Reel

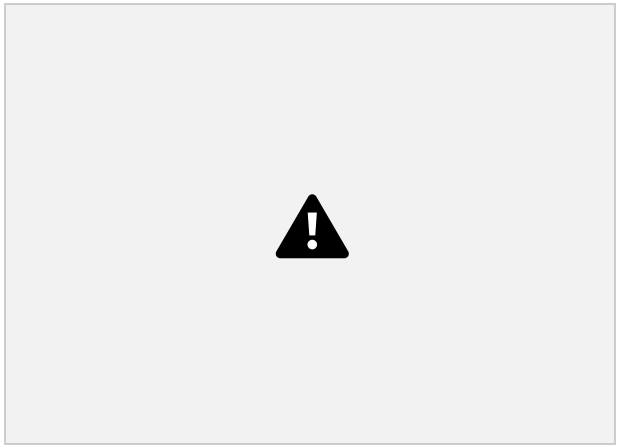


Experiment (3)

Influence of Potassium Foliar Fertilizer Application on Cotton Yield, Yield Components,

Fiber Quality, and Nutrient Use Efficiency of Three Cotton Varieties



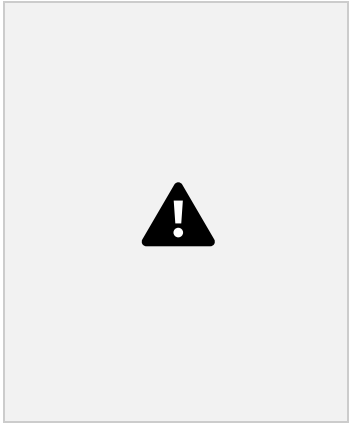


K-foliar requirement

❖**Potassium foliar applications offer the opportunity of correcting mid-season deficiencies quickly and efficiently,**

especially in the late season when soil application of K may not be sufficient.

(Oosterhuis, 2001)



❖Foliar-applications of K significantly increased seed yield of cotton

improving both lint quality and yield (Pettigrew et al., 1996)

❖Split utilization of potassium

reduce the effect of loss by leaching from sandy

soil low cation exchange capacity soils in high rainfall region lack of soil fixation

(Sawan et al., 2008)

❖Cotton new high yielding varieties demand a significantly high K supply

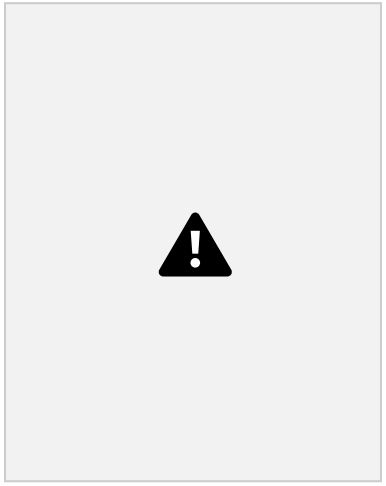
(Xia et al., 2013)

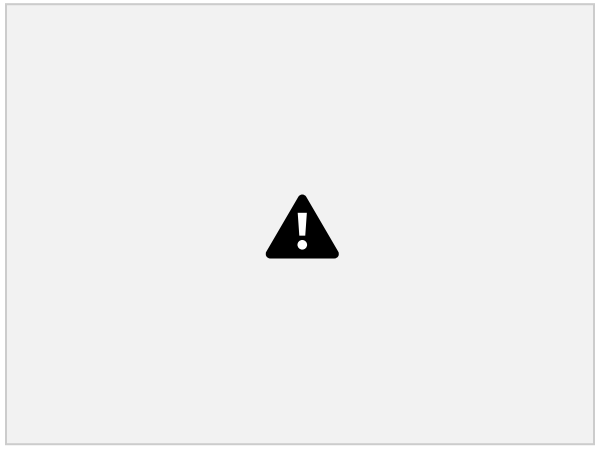
❖Potassium plays a particularly important role in cotton fiber development and a shortage would result in poorer fiber quality and lowered yields

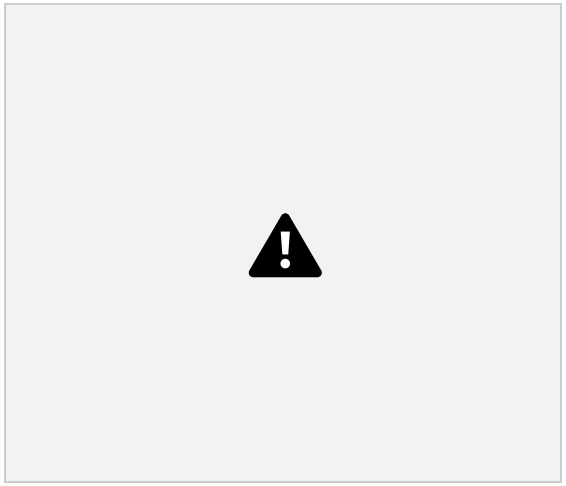
(Cassman et al. 1990) 

Objective

❖**To determine the influence of potassium application management on the cotton fibre quality**







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Material and method

Experimental Site - Aunglan Cotton Technology Farm Plot size - 4.5 m × 7.5 m Spacing - 0.75 m × 0.75 m – 2 plants / hill Period - 2018 - monsoon (June - October) - 2019 - monsoon (June - October)

- Design - **Split-Plot**
- Replication - **3**
- Main plot - **Three varieties - Ngwe Chi - 6 - LGNC - 4 - Shwe Daung - 8**
- Subplot - **Five potassium foliar fertilizer rates**

Application Time

Treatments

(K-foliar %) F_0	(control) Bud formation	(60 DAE) Flowering (75 DAE)	Boll formation (90 DAE)
F_1 (0.5)	✔ ✔ ✔	F_2 (1.0) ✔ ✔ ✔	F_3 (1.5) ✔ ✔ ✔ F_4 (2.0) ✔ ✔ ✔

Basal application is N:P:K rate = 86 : 24 : 90 (kg ha^{-1})32

⚠ Data Collection

- ❖ Yield
- ❖ Potassium Use Efficiency (KUE) ❖

Fiber Quality

❖ Cotton Yarn Quality

Ginning

Fiber Strength

FMT

Fibro graph

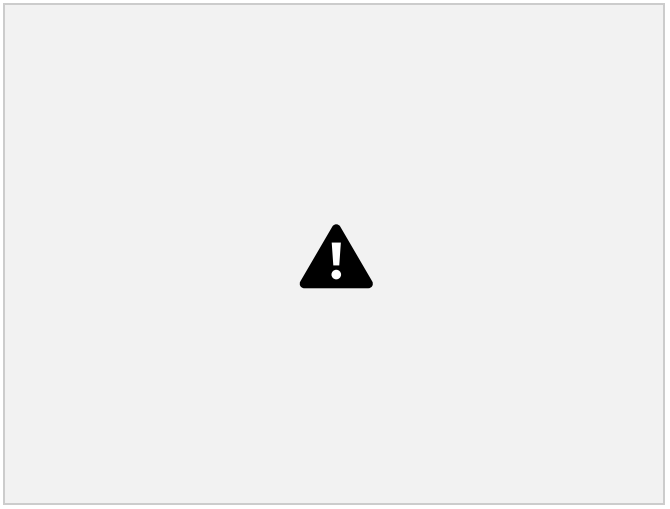
33 Yarn twist

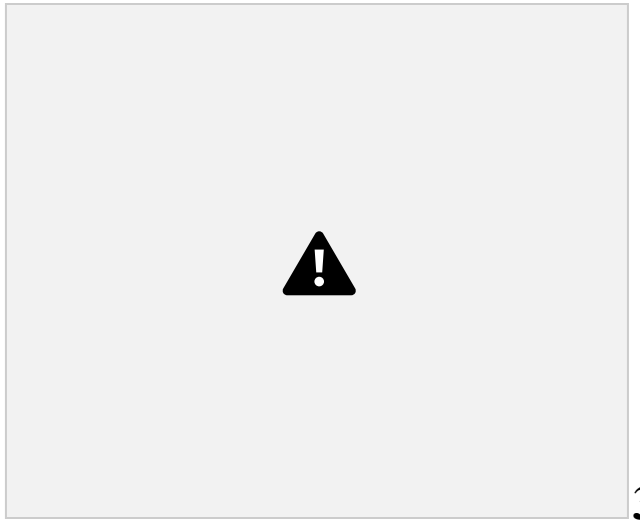
Data Analysis

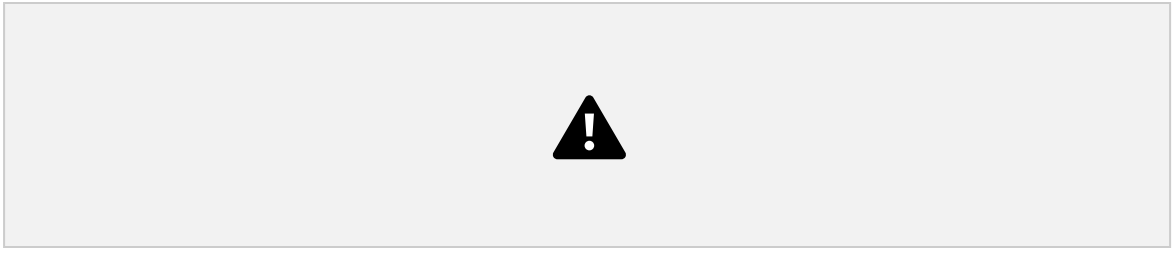
❖ Analysis of variance was performed by STATISTIX 8

❖ Treatments means were compared with

Least Significant Difference (LSD) at 5% level

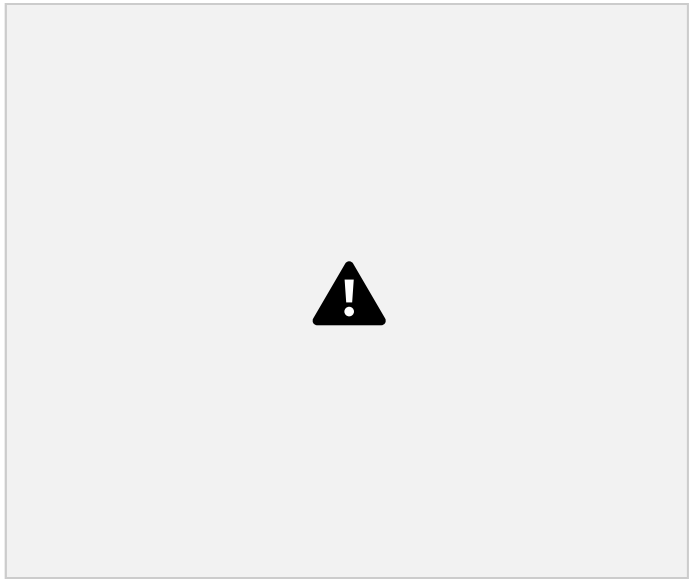


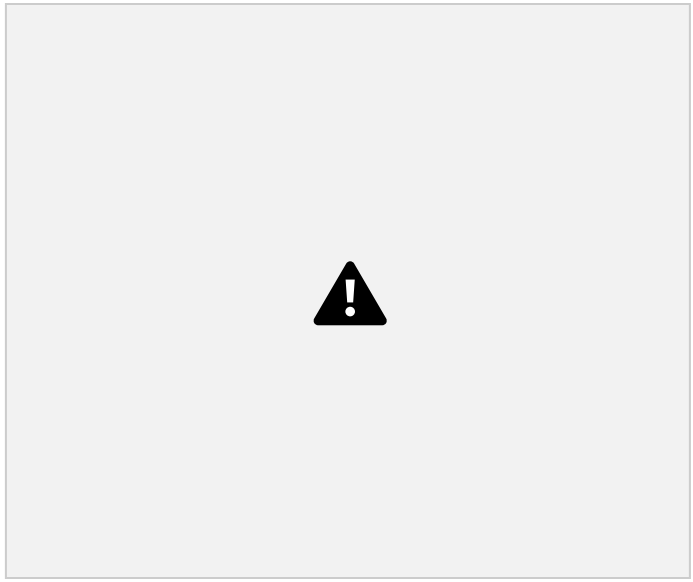


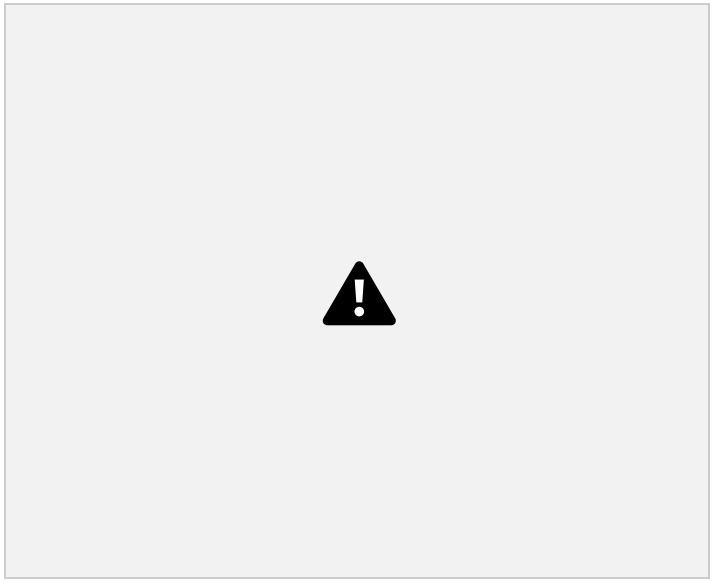


Results and

Discussion







According to experiment 3:

Due to supplementary of K-foliar, in monsoon experiments increasing

❖fruit set formation 7 to 14 % ❖total bolls per plant 7 to 13 % ❖harvested bolls per plant 2 to 17 % ❖opened bolls percentage 6 % ❖reduce fruit shedding (-14) to (-23) %

- yield per plant 5 to 16 %
- seed cotton yield 4 to 20 %
- lint yield 5 to 20 %
- cottonseed yield 4 to 20 %

- F_2(1 %) K-foliar provided the highest fiber strength
- F_3(1.5 %) gave the highest fiber uniformity.

❖ **K-foliar fertilization**

positive effect on highest strength counts

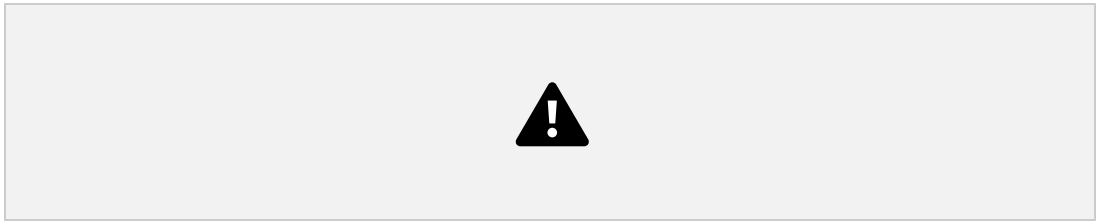
Increase 8.84 - 33.91 %

❖ **K-foliar together with soil basal K application**

- gave the higher seed cotton yield

- improved fiber quality

- Good yarn appearance



ACKNOWLEDGMENTS

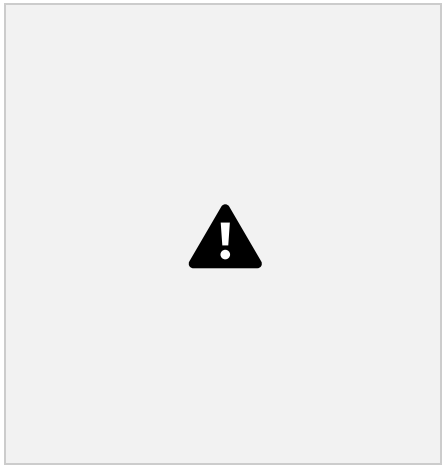
To express the sincere appreciation to financially supported by Department of Cotton and Allied Fiber Crops Division Department of Industrial Crops Development

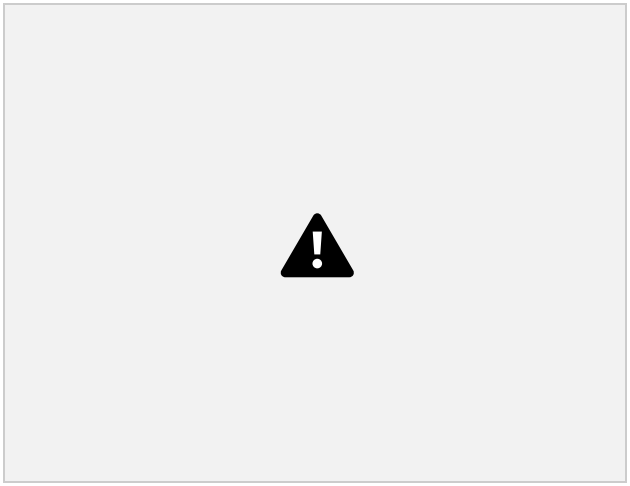
Department of Agriculture (Magway Division)

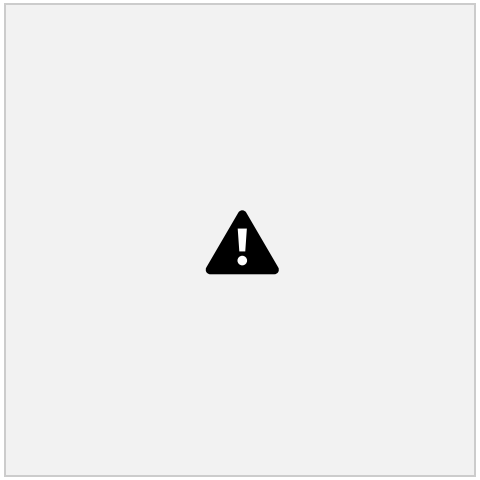
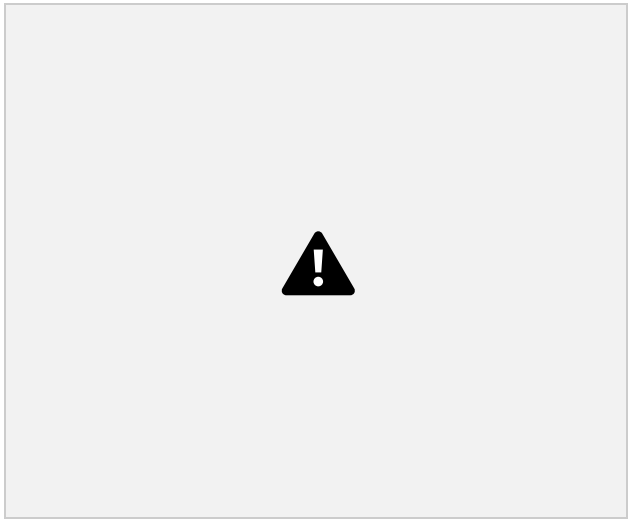
Aunglan Cotton Technology Farm Manager & staff members Staff members of Meikthila Fiber

Laboratory

- [ ] Staff members of Land Use Division
- [ ] Staff members of SSWAED (DAR), Yezin
- [ ] Yuntianhua Scholarship Program
- [ ] All Supervisory committee members



Thank You