SYNOPSIS

Of the proposed dissertation research work of M.Sc. In Agronomy

By

Anmolpreet Singh Nagpal

Reg .No. 11718194

"Effects of day and night temperature, water and harvesting date on the growth and leaf size and germination on different genotypes of wheat crop""

Submitted to

Department of agronomy
School of agriculture
Lovely Professional University
Punjab (India) 144411

Under the Guidance of

Dr. Priyamvada Chauhan

Assistant Professor, Department of Agronomy

Lovely Professional University

List of Contents

INTRODUCTION:

Wheat is one of the major crops of the world and has the prime position in the cereal crops. It belongs to the Gramineae family. It is the staple food of many countries in the world. The wheat comprises of 55% of the carbohydrates and food calories. It is rich in vitamin protein and carbohydrates so provides a balance diet to millions peoples of the world In India it holds the second position after the rice crop. The scenario of the crop is shown in the pictures below which is the data collected in the year 2015.

Wheat is grown on more land area than any other crop which is 220.4 million hectare in 2014 the world trade in wheat is greater than the other entire crop combined in 2016 the world production of wheat was 749 million tones making it the second most produced cereal after maize.

India's total geographical area is 329 million hectares. Out of this, 195 million hectare is gross cropped area and 141 million hectare is net sown area. On the other hand, net irrigated area is only 65.3 million hectares. Rest of the land is rain fed. The gross area was 31 million hectares. The production of wheat was 88.90 million tones. Yield of wheat was 2872 KG per hectare.

In India the wheat crop cultivation dates back to 5000 years however India 1947 the production and productivity of the wheat crop was very low the production was 6.46 million tons and productivity was 663 kg per hectare respectively but due to green revolution the production and productivity of wheat crop has increased to great level. in the current scenario India is the second largest producer of the wheat crop in the world after the China according to the latest report by the Indian department of the agriculture (Agricultural Statistics at a glance 2014- 2015)

The wheat crop is mainly grown in the Northern States and Uttar Pradesh is at the top with Total production of 25.22 million tons and it is followed by Punjab with 15.78MT. but the productivity of wheat crop is highest in Punjab .mainly three varieties of wheat crops are grown in India and the most common is the bread wheat T. durum and T. emmer are also grown depending on the suitable climate wheat is sown from the month of September to December in various states of India and harvesting is done from February to May. The winter temperature when the Sowing is to be done should range from 10 to 15 degree Celsius and at the time of harvesting it should be from 21 to 26 degree Celsius.

The leaf size is one the foremost factor which effect the yield of crop because the leaf size, area, length and breadth of leaf blade will decide the total photosynthetic area .the plants make food through the process of photosynthesis more is the area for photosynthesis more will be the food produced and higher will be the yield of crop. Taking this in consideration two varieties of wheat crop are grown in the plot. The aim is to check that leaf sizes depend upon

amount of water or it varies with the temperature variation. For this purpose the entire plot was divided into two halves in the first half irrigation is given during the critical growth stages and in the second half during other stages. The daily minimum and maximum temperature along with the night temperature are recorded. The main objective of this experiment is to check the effect of different harvesting dates on the yield attributes and on the germination of the seed that are harvested as the farmers are using the same seed again and again in a repetition without changing them for years. Generally it is recommended that the seed should be changed every 3 to 4 year as there is decrease in yield and decline in the produce due to usage of the same seed for sowing.

Wheat is one of the major crop and half of the population depend upon the wheat crop. The productivity has to be increased to fulfill the need of growing population .the yield of the crop has a direct correlation with the photosynthetic area and leaf size plays an important role in the yield of any crop so in this experiment we are going to check that leaf size depend upon temperature variation and not on the amount of water which is available and the effect of harvesting date on the germination of the next crop using the same seeds.

Objectives of the experiment:

- To estimate the effect of temperature variations and the night temperature on the leaf area of the wheat crop.
- To evaluate the effect of amount and availability of the water on leaf area and growth of the wheat
- To find the correlation between leaf area and harvesting dates on the yield of the wheat
- To find the effect of harvesting date on yield attributes.
- To find the affect of harvesting date on the germination of the next crop.

MATERIALS AND METHODS:

- The experiment was conducted at agriculture farms of Lovely Professional University, Punjab. The main material required for the experiment is the seeds of two varieties of wheat crop. The varieties are
- HD3086
- PBW 343

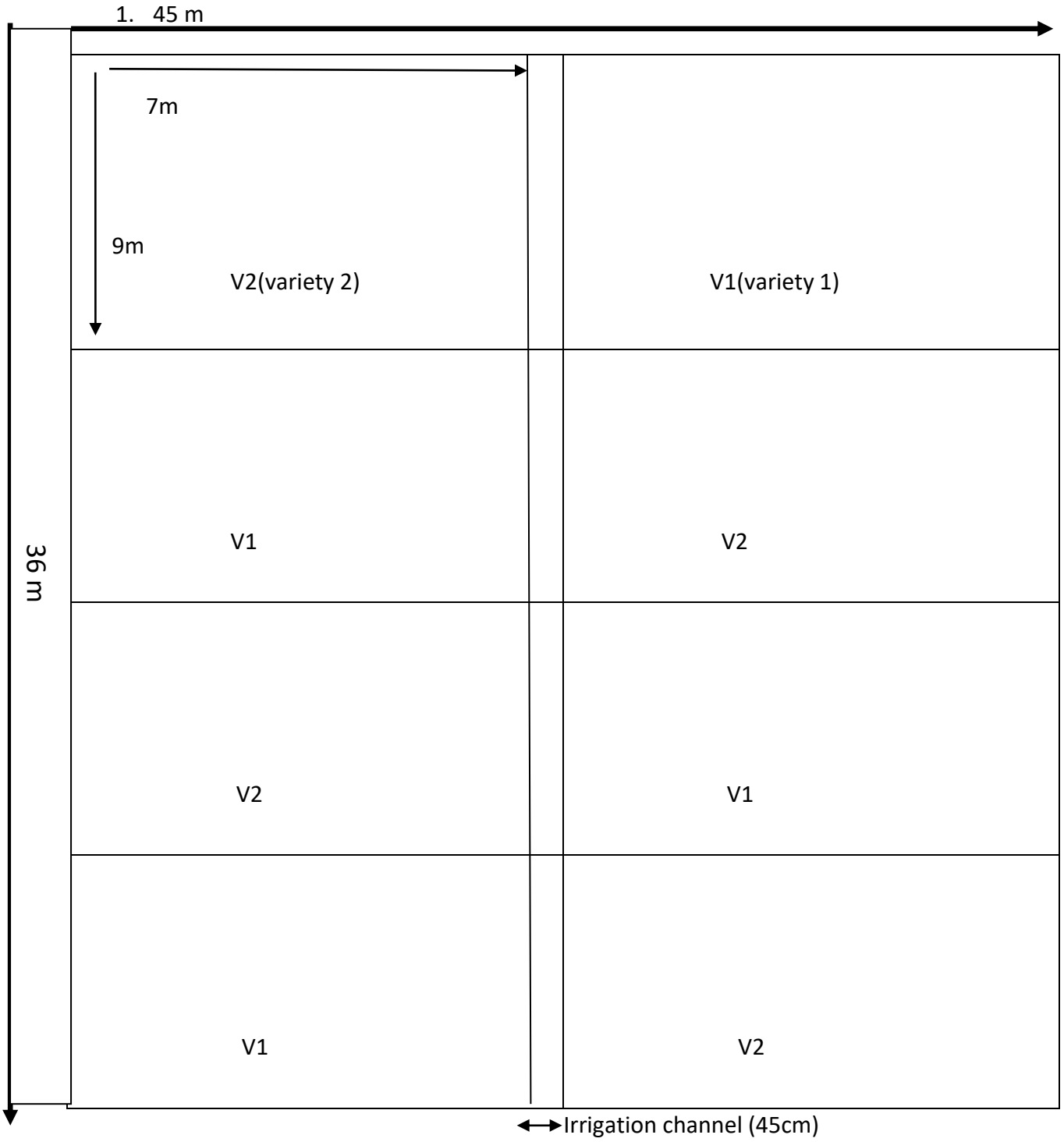
The two varieties are sown and the leaf size is measured during different growth stages. The entire plot is divided into two halves in the first half irrigation is given during the critical growth stages and in the second half during other stages. This is done to check that is there any relationship between the leaf size and amount of water. To check the effect of temperature daily minimum and maximum temperature are recorded. These temperature

details are used to calculate the growing degree days (which is amount of heat required by the crop during its growth period).The two genotypes were harvested on different dates to check there effect on the yield attributes of the crop and on the germination of the next crop using the same seeds.

Serial number	Variety	Origin	Time of sowing	Leaf type
1.	HD3086	Pusa, Bihar	Mid sown	Narrow
2.	PBW 343	PAU, Punjab	Mid sown	Narrow

Experimental design: the design which was follow to conduct the experiment was RBD. The plot will be divided into two parts and the two varieties of wheat will be sown. The irrigation was done at two times one during the critical growth stages and the second on other date. This is done to check the effect of the water availability on the growth of the leaves of two genotypes of the wheat varieties. The crop was harvested on different dates to check affect on yield and germination of the seed for next crop.

LAYOUT:


1. 45 m
7m
9m
V2(variety 2)
V1(variety 1)
V1
V2
V2
V1
V1
V2
36 m
Irrigation channel (45cm)

Experimental details

Treatments: 4

Replication: 2

Total no. of plots: 8

Design: RBD

Net plot size: 9 m x 7 m = 63 m

Total layout area: 36 x 14.45 =520.2m^2

Varieties of wheat: HD 3086 and PBW 343

Sowing time: 3rd December

Seed rate: 35to 40 kg/Acre

Date of harvesting: 27th April

Observation to be recorded: The following observations are to be made:

2. Field emergence percentage
3. Plant height(cm)
4. Leaf length(cm)
5. Leaf width (cm)
6. Flag leaf length (cm)
7. Flag leaf width(cm)
8. No. of tillers per plant
9. Ear length(cm)
10. Ear width(cm)
11. Test weight(g)
12. Yield per plot(kg/area)
13. Germination percentage
14. Number of seedlings

Statistical analysis: the data recorded throughout the growing season will be analyses as there factor analysis with the help of **OP-STAT software** developed by HAU, Hisar

REVIEW OF LITERATURE

The experiment was conducted by **Wright et al. (2017).** A global team of 17 scientists including a University of Queensland researcher has cracked the mystery of why plant leaves vary wildly in size.UQ School of Biological Sciences postdoctoral fellow Dr Elizabeth Law said it was a century-old conundrum for scientists as to why leaf size varied with latitude – from very small near the poles to massive leaves in the tropics."While the textbooks say it's a balance between water availability and overheating, we just didn't see that in the data," she said.The research, led by Associate Professor Ian Wright from Macquarie University, revealed that in much of the world, key factors affecting leaf size were night temperatures and risk of frost damage to leaves. The international team of researchers analyzed leaves from more than 7600 species across the world. The data was teamed with new theory to create a series of equations which predict the maximum viable leaf size anywhere in the world based on the risk of daytime overheating and night-time freezing.

A growth chamber experiment was carried out by **Bos and Jan (1997)** with young spring wheat (*Triticum aesti.um* L.) Plants and individual leaf area parameters were measured. Treatments were temperature (daily mean 10±5, 15±5 and 20±5 °C) and light intensity (111, 191 and 286 lmol m−# s−“). Effects of leaf position and tiller type on maximum leaf width and leaf elongation rate (LER) could be explained by a new assumption, that maximum leaf width, and LER, of a leaf depend on the values for the previous foliar leaf on the same tiller, or on the parent tiller. LER increased linearly with temperature and was not affected by light intensity, whereas maximum leaf width was

Not influenced by temperature or light intensity. Leaf elongation duration was closely related to phyllochron expressed in days, although this relation was slightly modified by light intensity. Equations formulated for each leaf Area parameter accounted for 90% of the variation in leaf area between different leaf types, temperatures and light intensities. The results give a better general understanding of individual leaf growth of Gramineae species and can be used in the development of more mechanistic models for the simulation of leaf area expansion

Experiment was done by **Porter and Gawith (24 August 1998)** start by outlining the general effects of climatic variability and temperature extremes on wheat yields in the context of extreme event effects on crop processes for climatic impacts studies. We then review literature describing the responses of wheat plants to extreme temperatures. Cardinal temperature thresholds for different phenological processes in wheat are identified and we outline the effects of temperature on rates of growth and development. Finally, we assess the

implications of the above for future climatic impact studies. Our summary shows how relatively small and consistent are the standard errors of the cardinal mean temperatures for many of the processes examined. Cardinal temperatures are conservative between studies and are seemingly well defined in wheat. Into this category we put the lethal limits for wheat, the sterility response at anthesis, the cardinal temperatures for vernalization and some of the base and optimal temperatures. Important questions for the future involve the effects of combinations of extreme events and the modelling of specific effects such as the influence of high temperatures on grain set.

An experiment was conducted by **Boyer (1968)** and observed that leaf growth occurred in sunflower only when leaf water potentials were above -3.5 bars. Sunflower leaves therefore require a minimum turgor for enlargement, in this instance equivalent to a turgor of about 6.5 bars. The high water potentials required for growth favored rapid leaf growth at night and reduced growth during the day.

For the experiment done by **Fischer and Kohn (1962)** crops grain yield was closely correlated with leaf area duration after flowering which in turn was related to leaf area index at flowering and to the rate of senescence of photosynthetic tissue.

The hypotheses that yield of grain per plant are proportional to the photosynthetic area above the flag-leaf node was tested on 120 varieties of wheat by Simpson (1968) under greenhouse conditions. High, positive correlation coefficients were obtained between grain weight and the components of photosynthetic area above the flag-leaf node, both per tiller and per plant basis.

This paper presents an experiment on energy and water fluxes of wheat crops by **Duchemin (18 February 2005)** as part of the ‘‘SudMed’’ project (Chehbouni et al., 2003, 2004). The overall objective of the project is to understand the processes that affect the water and energy balances of semi-arid areas at the basin scale

The experiment was conducted by **Lafitte (2002)** to examine the relationship between plant water status (measured as leaf relative water content, RWC) and yield and spikelet sterility (%SS) for aerobically grown rice exposed to water deficit during the reproductive stage.

Two cultivars of avocado were studied by **Chartzoulakis (August 2002)** under two irrigation regimes for 6 months in order to evaluate the growth response and leaf physiological and anatomical changes induced by moderate water stress

The experiment was done by **GALLAGHER, BISCOE and WALLACE (1979)** throughout winter and early spring, rule and auxanometer measurements showed that leaf extension rate (RE) was directly related to temperature and stopped at about 0 °C. During this period, both

night and day time RE responded similarly to temperature. Bright sunshine in late April and May caused fast transpiration which was associated with low leaf water potential (ψ) and slow RE. When bright sun was obscured by cloud, RE increased but this did not compensate for previous slow RE. Leaf turgor potential, calculated as the difference between ψ and leaf osmotic potential, was large (0.6—1.8 MPa) and bore little relation to RE. Low ψ was associated with slower RE than would have been expected without water stress, but the relation was not unique. On a bright day in May, adaptation to low ψ occurred and during the afternoon RE was faster than at similar values of ψ and meristem temperatures before noon. The response of RE and duration of leaf extension to temperature suggested that for any particular leaf grown under field conditions, variation in mean growing temperature would affect final leaf length only slightly. Because severe water stress slows RE without affecting the duration of leaf extension markedly, it decreases final leaf size.

A two years field study was carried out in the research field and laboratory of Seed Technology Division, Bangladesh Agricultural Research Institute, Gazipur, Bangladesh during *rabi* season by **M.R. Shaheb, M.N. Islam, A. Nessa, and M.A. Hossain** in **(2008-10).**The aim of this study was to determine the effect of five different dates of harvest viz. H1: 65 Days after emergence (DAE), H2: 70 DAE, H3: 75DAE, H4: 80 DAE and H5: 85 DAE on the seed yield and viability of French bean. The experiment was laid out in randomized complete block design (RCB) with four replications. Results showed that the yield and yield contributing parameters significantly influenced the days to harvesting. The highest seed yields of 1.15 and 1.31 t ha-1 were obtained from the harvest of 75 DAE (Days after emerge nce) in 2008-09 and 2009-10, respectively. On the contrary, seed quality parameters like seed germination, root length and vigour index were also significantly influenced by harvest time. The highest seed germination percentage of 91.33 and 91.56 were recorded from the seed plots harvested at 75 DAE (pods are light brown with few yellow color) both for the year 2008-09 and 2009-10, respectively. Similarly, the vigour indexes (12.49 and 11.64) were the highest in seed harvested at 75 DAE from the year of 2008-09 and 2009-10, respectively. This might be due to more food reserve and dry matter accumulation on the seed at later harvest. However, seeds harvested in 80 and 85 DAE were also found good for seed yield and seed quality.

Soybeans IAC-8 was harvested in the growth stages R7 and R8 commercial harvesting time and at two other subsequent times to compare their physiological and technological characteristics by **J. MARCOS-FILHO2; H.M.C.P. CHAMMA; J.R. R. CASAGRANDE; E.A. MARCOS** in (**1993)** Seeds were stored at two moisture levels, 12% and 15%, for 6 months. Germination and vigor (accelerated aging, electrical conductivity), oil and free fatty acids, peroxide and iodine values were evaluated periodically. As expected, the time of harvesting and seed moisture content affected seed performance; while oil content did not correlate to physiological quality as did acidity, peroxide value and iodine number.

REFERENCES

1. **Bos,H.J.,Neueteboom, J.H. 1997. Growth of Individual Leaves of Spring Wheat (*Triticum aestivum* L.) as Influenced by Temperature and Light Intensity.** *Annals of Botany.* **81:** 141-149.
2. **Boyer, J.S.1968 Relationship of Water Potential to Growth of Leaves'** *Plant physiol* (**1(68)** 43 :1050-106.
3. **Chartzoulakis, 2002 K Water stress affects leaf anatomy, gas exchange, water relations and growth of two avocado cultivars** *Scientia Horticulture.* **95(1–2)** : 39-50.
4. **Duchemin,B. 18 February 2005 on the use of relationships between evapotranspiration, crops coefficients, leaf area index and remotely-sensed vegetation indices** *Agricultural Water Management* .**79** : 1–27.
5. **Fischer,R.A.and KohnG.D. 1966. the relationship of the grain yield to vegetative growth and post flowering leaf area in the wheat crop under conditions of limited soil moisture.** *Australian journal of agricultural research* **17(3):** 281-295
6. **J. N. GALLAGHER, J.N.,BISCOE, P.V. and WALLACESJ.S.1979winter wheat leaf extension in relation to temperature and leaf water status .***Journal of Experimental Botany* Vol. 30, No. 117),: 657-668.
7. **Lafitte,R. 2002. Relationship between leaf relative water content during reproductive stage water deficit and grain formation in rice** .*Field Crops Research* **. 76(2–3):** 165-174
8. **Porter,J.R. and Gawith,M.1998. Temperatures and the growth and development of wheat.** *European Journal of Agronomy* 10 (1999): 23–36.
9. **Simpson,G.M.1968. association between grain yield per plant and photosynthetic area above the flag leaf node in wheat.** *Canadian Journal of Plant Science.* **48(3):** 253-260.
10. 10 **.Wright, I.J. 2017. Leaf size depends upon the frost risk, not water content.** *Science*: 10.1126/science
11. **M.R. Shaheb, M.N. Islam, A. Nessa, and M.A. Hossain effect of harvest times on the yield and seed quality of french bean** *SAARC J. Agri., 13(1):01-13 (2015)*
12. **J. MARCOS-FILHO2; H.M.C.P. CHAMMA; J.R. R. CASAGRANDE; effect of harvesting time on seed physiological quality, chemical composition and storability of soybeans** *Enviado para publicação em 13.12.93*