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PLANTING DATE-RELATED FACTORS ON THE GROWTH OF COTTON, BATAC, ILOCOS NORTE

Leonila M. Tolentino
Department of Crop Physiology
Cotton Research & Development Institute
Batac, Ilocos Norte, Philippines

ABSTRACT

Cottonseeds of UPL-C2 were sown during crop years 1982-85 every 1st and 16th day of the month: (1) to relate the growth and development of plants to different planting dates and to the prevailing climatic conditions and (2) to relate the occurrence of insects to different planting dates. Plant growth, number of days to squaring, flossing and seedcotton yield were significantly affected by planting dates and planting date-related factors. Maximum yields were obtained when the crop was grown from April 16th to January 1st. The occurrence of insect pests was likewise significantly influenced by the different planting dates.

Introduction

Cotton plants require adequate soil moisture during its stages of vegetative growth (PCC, 1978). Planting should be done between September and October to take advantage of the remaining soil moisture and allow enough dry weather for the bolls to mature and to be harvested by March-April undamaged by rain. Moreover, Cabangbang (1984) reported that in the Ilocos provinces, planting is normally done in August or September so that harvesting falls within January to February. High quality fibers are produced from this crop because harvesting falls within the driest part of the year. However, in Batac, Ilocos Norte we could not fit cotton into this planting date because of the prevailing cropping pattern, hence the importance of this study.

This study was conducted to relate the growth and development of the plants to the different planting dates and to the prevailing climatic conditions and to relate the occurrence of pests to the different planting dates.

Materials and Methods

Seeds of UPL-C2 were sown in a 4.5 m^2, 12.0 m^2 and 18.0 m^2 plots during the crop years 1982-83, 1983-84 and 1984-85, respectively every 1st and 16th day of the month from September 1982 to August 1985.

Variations in climatic factors of weekly mean relative humidity, maximum and minimum temperature, daylength or photoperiod, total bright sunshine, windspeed and weekly total rainfall were achieved by the different planting dates.

A 75 - 25 - 25 kg N, P_2O_5 and K_2O per hectare was used in the experiment. Twenty five kg N, P_2O_5 and K_2O per hectare was applied at planting and the remaining N was sidedressed 35 days after emergence. Weeding, irrigation and spraying were done when the need arose.

A scatter diagram of the data was made to determine the best regression model fitted to each observation. Regression (simple linear, second degree and stepwise regression models) and correlation analysis (simple linear) were used in analyzing the data.

Results and Discussion

Vegetative growth

Plant height, length and number of sympodial branches which were used as measures for vegetative growth were greatly influenced by the different planting dates (Table 1). Cotton plants planted from June to December were taller than those planted from January to May, perhaps due to higher soil moisture content and relatively lower temperature during those months. These conditions probably favored cell growth especially elongation of individual cells thus consequently producing more robust plants. Longer sympodial branches were observed from May to October planting indicating that lateral growth was more extensive during these months.

Table 1. Relationship between the agronomic characters of cotton and dates of planting

Agronomic characters	R^2 value
Length of sympodial branches	0.6335**
Number of sympodial branches	0.6890**
Plant height	0.8587**
Average boll per plant	0.7479**
Average weight per boll	0.5898**
Seedcotton yield	0.5059**
Days to squaring	0.4071**
Days to flossing	0.3391**

**Significant at 1% level

Vegetative growth was likewise influenced by the different climatic variables during the growing season (Table 2). The different climatic variables i.e. total bright sunshine, rainfall, relative humidity, photoperiod, windspeed, maximum and minimum air temperature played a major role in the growth and development of the cotton plants. Water for example is the major constituent of physiologically active plant tissue and is an essential element for the maintenance of plant turgidity, necessary for cell enlargement and growth. Maung Mar (1979) showed the significance of lower temperature in the development of vegetative branches.

Table 2. Relationship between the different agronomic characters of cotton and the different weather variables.

Agronomic characters	R^2 value
Plant height	0.6606**
Number of sympodial branches	0.8333**
Length of sympodial branches	0.8258**
Average boll per plant	0.8792**
Average weight per boll	0.9095**
Seedcotton yield	0.7707**
Days to squaring	0.6130**
Days to flowering	0.4981*
Days to flossing	0.7537**

*Significant at 5% level
**Significant at 1% level

Fruiting

Number of days from emergence to squaring and flossing were significantly affected by planting dates (Table 1). Cotton planted from September to December 1st produced squares earlier (about 25-30 days after emergence) compared with those planted from December 16th to August (about 31-45 DAE), brought about probably by the differences in photoperiod observed throughout the growing season. Boll maturation as manifested by the number of days to flossing was shorter with those planted from January to July 1st (81-97 DAE) as compared with those planted from July 16th to December (101-117 DAE). The presence of lower soil moisture being made available to the growth of the plants could have contributed to this phenomenon. Chang (1968) reported that water deficiencies reduced yield, changed the pattern of growth, but enhanced boll maturity.

All the climatic variables considered except for rainfall had significant contribution to number of days to squaring and flowering (Table 3). These two phenomena were enhanced. Number of days to flossing, on the other hand, was significantly affected by relative humidity and temperature. Low relative humidity coupled with high temperature enhanced boll opening. Gipson *et al.* (1968) and Rijks (1967) found that relatively high temperature six weeks after sowing had significantly increased the rate of development of the fruiting points. Other studies (Mauney and Philipps, 1963; Mauney, 1966; Manuel, 1982) showed evidences that the different climatic/environmental factors had significant effect on the production of squares or flowers buds.

Yield

Seedcotton yield was greatly affected by dates of planting (Table 1). Maximum yields (1.71-6.07 tons/ha) were obtained from April 16th to January 1st plantings while low yields (0.88-1.53 tons/ha) were obtained from January 16th to April 1st plantings. Lower yields during those months might be due to relatively smaller plants with fewer and shorter sympodial branches. Average boll per plant and average weight per boll were likewise significantly affected by planting dates.

Response of the cotton plant to the different climatic factors is shown in Table 3. Seedcotton yield was significantly affected by windspeed, rainfall, photoperiod and maximum temperature. Previous researchers have similar results (Dunlap, 1945; Eaton and Ergle, 1954) where they observed yield reduction in reduced light intensities. Likewise, Manuel (1982) noted the importance of photo-

Table 3. Regression equations on the different agronomic characters of cotton and the different climatic variables

Equation			R^2 value
Dsquaring	=	–1184.70 + 64.69 WS + 7.62 RH + 0.28 TBS – 29.81 PP + 12.47 Tmax + 15.22 Tmin	0.6130**
Dflowering	=	– 1607.81 + 86.78 WS + 11.97 RH + 0.27 TBS – 29.39 PP + 14.95 Tmax + 13.39 Tmin	0.4931*
Dflossing	=	– 414.10 + 7.11 RH + 1.29 Tmax – 5.51 Tmin	0.7537**
Ave. boll/ plant	=	29.34 – 20.05 WS + 0.19 TBS + 5.70 PP – 3.90 Tmax	0.8792**
Ave. wt/boll	=	56.57 + 2.28 WS – 0.03 TBS – 0.004 RR – 1.12 PP – 0.91 Tmax	0.9095**
Seedcotton yield	=	94985.4 – 5459.19 WS – 13.82 RR + 2595.8 PP – 3403.98 Tmax	0.7707**

*Significant at 5% level
**Significant at 1% level
WS – windspeed
PP – photoperiod
RH – Relative humidity
TBS – Total bright sunshine
Tmax – Maximum temperature
Tmin – Minimum temperature

period in obtaining maximum yields. Although Chang (1968) observed the significance of relative humidity in photosynthesis, seedcotton yield was not affected by relative humidity in the present study.

Results obtained indicate that the different climatic factors are vital in the attainment of maximum yield. Wind is necessary in facilitating the entrance of carbon dioxide, the raw material for photosynthesis, within the plant canopy. The rate of photosynthesis increases with the supply of CO_2, which in turn is favored by turbulence. Water, on the other hand, is fundamental to crop growth because of its role in photosynthesis. Plant water stress directly reduces the photosynthesis process because dehydrated protoplasm has lower photosynthetic capacity. Once the leaves lose their turgidity, the stomata close, thus preventing any further intake of CO_2 for photosynthesis. Air temperature is known to markedly influence growth and productivity of cotton. Thus, for a successful crop, cotton is best grown in areas where growing season has warm days and cold nights (Rijks, 1967). Maximum yield per plant had been obtained with day and night temperature of 29°C and 16°C, respectively.

Insect pests

The different insects observed in the experimental area had varied responses to the different planting dates (Table 4). Aphids, leafhoppers, flowerweevils, and pink-bollworm, were significantly influenced by the different planting dates. Their degree of occurrence, however, varied, i.e. aphid population was very high during the early part of the growing season and it decreased progressively as the season progressed. Leafhoppers, on the other hand, were abundant from March to June plantings. During the rest of the growing season, their degree of occurrence was negligible. High leafhopper population might be brought about by the dispersion of insects from the other plantings nearby. Bollworms were not observed from January to May 1st plantings. Probably, prevailing conditions during those months were not conducive for bollworm infestation.

Table 4. Relationship between insect population and planting dates

Insect population	R^2 value
Aphids	0.8659**
Leafhoppers	0.2548*
Flowerweevils	0.6758**
Bollworms	0.0144^{ns}
Phinkbollworms	0.9330**
Cottonstainers	0.2185**
Thrips	0.1186^{ns}
Spidermites	0.0841^{ns}

*Significant at 5% level   ns not significant
**Significant at 1% level

Table 5. Correlation analysis between insect population and the different variables

Insect population	Climatic Variables						
	Wind speed (km/hr)	Relative humidity (%)	Total bright shine	Rainfall (mm)	Photo-period (hrs.)	Air temperature maximum (°C)	Air temperature minimum (°C)
Aphids	0.264^{ns}	–0.282^{ns}	–0.655**	–0.536**	–0.636**	–0.395^{ns}	–0.681**
Leafhoppers	0.108^{ns}	–0.113^{ns}	0.142^{ns}	–0.131^{ns}	0.154^{ns}	–0.288^{ns}	–0.172^{ns}
Bollworms	–0.292^{ns}	0.349^{ns}	0.043^{ns}	0.049^{ns}	–0.354^{ns}	–0.433*	–0.185^{ns}
Pinkbollworms	0.140^{ns}	–0.104^{ns}	–0.116^{ns}	0.035^{ns}	0.312^{ns}	0.105^{ns}	0.155^{ns}
Bollweevils	0.406*	–0.307^{ns}	0.712**	–0.650**	–0.653**	–0.513*	–0.776**
Cottonstainers	0.503*	–0.361^{ns}	0.563**	–0.604**	–0.362^{ns}	–0.243^{ns}	–0.591**
Spidermites	–0.083^{ns}	0.044^{ns}	0.194^{ns}	–0.012^{ns}	–0.293^{ns}	–0.251^{ns}	–0.199^{ns}
Thrips	–0.160^{ns}	0.063^{ns}	0.098^{ns}	–0.007^{ns}	–0.262^{ns}	–0.260^{ns}	–0.132^{ns}
Semilooper	–0.358^{ns}	0.359^{ns}	–0.201^{ns}	0.215^{ns}	–0.131^{ns}	–0.248^{ns}	0.062^{ns}

*Significant at 5% level

**Significant at 1% level

ns Not significant

Of the insects observed in the experimental area, only bollworm and bollweevil were found to be greatly affecting seedcotton yield. Variations in the yield could be explained by bollworm and bollweevil populations by as much as 81%. Seedcotton yield decreased with increasing bollworm and bollweevil population. The decrease resulted from damage of squares, flowers and bolls by these insects.

Insect population was likewise greatly affected by the different climatic variables except for spidermites, thrips and semilooper (Table 5). The different insects had varied responses to the different climatic factors. Bollweevil was positively correlated with windspeed, total bright sunshine and photoperiod while a negative correlation was observed with rainfall and air temperature. This finding indicates that bollworm would prefer cooler temperatures, a main reason no bollworm larva were observed on leaf surfaces towards noon time. They preferred to stay inside the squares and bolls of the cotton plants.

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