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**Research Article**

# A Study on the Growth Characteristics and Productivity of Different Corn Cultivars at Different Environmental Locations in South Korea

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## ABSTRACT

It is widely known that forage corn is one of the most important crops in the production of silage and green chops during the summer months. In this study, the characteristics and the productivity of Kwangpyeongok, AGR 41, and Nero IT corn cultivars were evaluated in the regions of Jeju and Cheonan, Korea between 2021 and 2022. In each year, different corn cultivars were sown in different parts of the country on April 7 in Jeju and May 3 in Cheonan. The yield of three cultivars, Kwangpyeongok, AGR 41, and Nero IT were measured at the yellow-ripening stage, including the leaves and stems (Stover) and corn grain. Kwangpyeongok stover and total dry matter (DM) yields were slightly higher in Cheonan than in Jeju over the past two years. The quantity of corn cultivated in all cultivated areas was similar. The average yield of AGR 41, corn quantity and total DM were slightly higher in Jeju than in Cheonan. In terms of stover yield, and total dry matter content of the Nero IT cultivar cultivated in Jeju had a slightly higher yield than the cultivar cultivated in Cheonan. Based on this study, all cultivars can show some variations but not too much in terms of growth productivity and distinct characteristics depending on their location. Overall, AGR 41, and Nero IT cultivars in Jeju exhibit slightly higher levels of productivity than the same cultivars in Cheonan.

**(Key words**: Chacracteristics and productivity, Cheonan, Different corn cultivars, Jeju)

## Ⅰ. INTRODUCTION

Among the most essential foods for human health are cereals such as corn, wheat, and rice, and the demand for them is expected to rise by over 3.3 billion by 2050 (FAO, 2020). Global corn production reached 1.1 billion tons in 2019 (OECD/FAO, 2020), making it one of the most widely cultivated and utilized cereal crops. Corn has been used in the production of food, biofuels (Mumm et al., 2014), and livestock products (Tilden Wayne Perry, 1988; Revilla et al., 2022). Corn is a C4 plant and grows well in both high and moderate temperatures. Moreover, corn has a high degree of climate and soil adaptability compared with other crops (Son et al., 2009). Global temperatures have increased by plus1.1°C in the years between 2019-2019 as compared to the years between 1850 and 1900, as reported by the World Meteorological Organization.

Extreme temperatures during pollination and water deficits reduce maize production. According to Tigchelaar et al. (2018), empirical models of maize production have been combined with future warming scenarios, which predicts that maize yields will decrease by 20–40% and 40–60% with a temperature increase of 2 and 4 degrees Celsius, respectively (Tigchelaar et al., 2018). The effects of heat stress and drought on annual maize production, variability, and trend were estimated using a statistical model from a country level to a global level, and the observed global production variability can be explained by heat stress and drought for 50% of the period 1980-2010. Further, the model indicates global maize losses due to extreme climate events, which are increasing at 1.5°C global warming levels (about 2020), which will become the new normal. The late 2030s will see temperatures rise by 2 °C, resulting in heat stress and drought that have never been experienced before (Zampieri et al., 2019).

Temperatures on the Korean peninsula have increased by plus 1.2°C over the past three decades (1981-2010) and precipitation by 77.6 mm (KMA, 2020). Temperatures and precipitation will increase by +4.7°C and +13.1%, respectively,

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according to Representative concentration pathway-8.5 RCP. Increased temperatures have also changed precipitation levels, resulting in abnormal climate conditions that affect all areas of the agricultural industry (FAO, 2016). Heat waves, droughts, and heavy precipitation have already been shown to lead to crop failures and to affect crop yield variability. The impact of climate change on crop cultivation has been reported by several researchers (Peng et al., 2015; Peichl et al., 2019). In 2019, Sang et al. assessed the vulnerability of corn cultivation to climate change in the central region of South Korea. The intention of this study was to determine the characteristics and productivity of three corn cultivars (Kwangpyeongok, AGR 41, and Nero IT.) in the Korea provinces of Cheonan, and Jeju, which have different climatic conditions.

## Ⅱ. MATERIALS AND METHODS

### 1. Study area

Cheonan is most popular city in Chungcheongnam-Do province and it has average daily temperatures above 76°F between May 26 and September 21. In Cheonan, August is the hottest month of the year with an average temperature of 29.5°C and lowest temperature was 21.6°C The cold season began on December 1 and will last until February 28, with daily high temperatures below 7.2°C on average. Throughout the year, Cheonan experiences significant variations in precipitation. A day with precipitation greater than 31% of the time in Cheonan between June 18 and September 12. Jeju is an island located in south Korea with warm, humid and rainy summers and mild winters. A daily average temperature over 25°C from June 24 to September 16. August is the hottest month in Jeju, with an average high temperature of 29°C and low temperature of 24°C. During the cold season, daily high temperatures are typically below 12°C from December 6 to March 15.

### 2. Experimental Design

The experimental fields latitudes 36. 931739/ longitude 127.106166 and latitudes 33.465603 /Longitude126.517519 were used in the Cheonan and Jeju regions, respectively. The sowing of corn was conducted on May 3 and May 2 in 2021 and 2022 in Cheonan respectively. Corn was sown in Jeju in 2021 and 2022 on April 8 and April 7, respectively and size of the plot was 12 $m^2$ (3 × 4. For corn planting density, two seeds were sown at a rigid with and inter-row space of 75 cm × 20 cm. After, 7 to 8 leaf stage, the superior plant was maintained and remaining was removed. A plot of 12 $m^2$, four rows of 4 m length were sown at intervals of 20 cm, with each row 75 cm apart from the adjacent row. The nitrogen (100 kg/ha), phosphorus (150 kg/ha), and potassium (150 kg/ha) per hectare were applied as basal fertilizer. Additional fertilizer nitrogen (100 kg/ha) was applied at the time of crop growth was at the four to six leaves stage.

### 3. Data analysis

Corn growth characteristics such as stem height, stem diameter and dry matter yields of stover and grain were determined at the yellow-ripening stage in accordance with the research analysis criteria for agriculture and science technology (RDA, 2012). Meteorological data, including average temperature (C), maximum temperature (Tmax) and minimum temperatures (Tmin) and precipitation, were obtained from Korea Meteorological Administration (kma.go.kr).

### 4. Statistical analysis

Statistical analysis of the experimental data was performed using IBM SPSS 27 software. In order to determine whether there was a statistically significant difference between the cultivated regions of Cheonan and Jeju, a t-test was used. Statistical significance was determined at a level of $p$ <0.05.

## Ⅲ. RESULTS

### 1. Meteorological data

As shown in Fig. 1, maximum and minimum temperatures and precipitation levels were measured between the sown and harvesting periods in Cheonan and Jeju during 2021 and 2022. The maximum average temperature in Cheonan during the sown period was 12°C in 2021 and 15°C in 2022. The minimum average temperature ranges in Cheonan during sown period were 0.6°C and 4.1°C in years 2021 and 2022, respectively. The hottest average temperatures were recorded in late July and early August

of 2021 and 2022, respectively. A maximum amount of precipitation was recorded in Cheonan in mid-June 2021 and early July 2022. In 2021 and 2022, Jeju had maximum temperatures of 13.1°C and 11.1°C, respectively, during the sown period. Late July and early August were the hottest months in 2021 and 2022, respectively. In 2021 and 2022, Jeju recorded its maximum precipitation in late July. In contrast, the average precipitation in Cheonan was higher than in Jeju.

## 2. Kwangpyeongok cultivar growth characteristics and yield in Cheonan and Jeju

During the ripening stage, stem height and diameter, ear and plant yield, and total dry matter yield of the Kwangpyeongok cultivar were measured. In two years, the stem length of Kwangpyeongok cultivar was the same in Cheonan and Jeju. Although Kwangpyeongok cultivar height was higher in Cheonan in 2021 than in Jeju ($p$<0.05). The height of corn in both cultivated

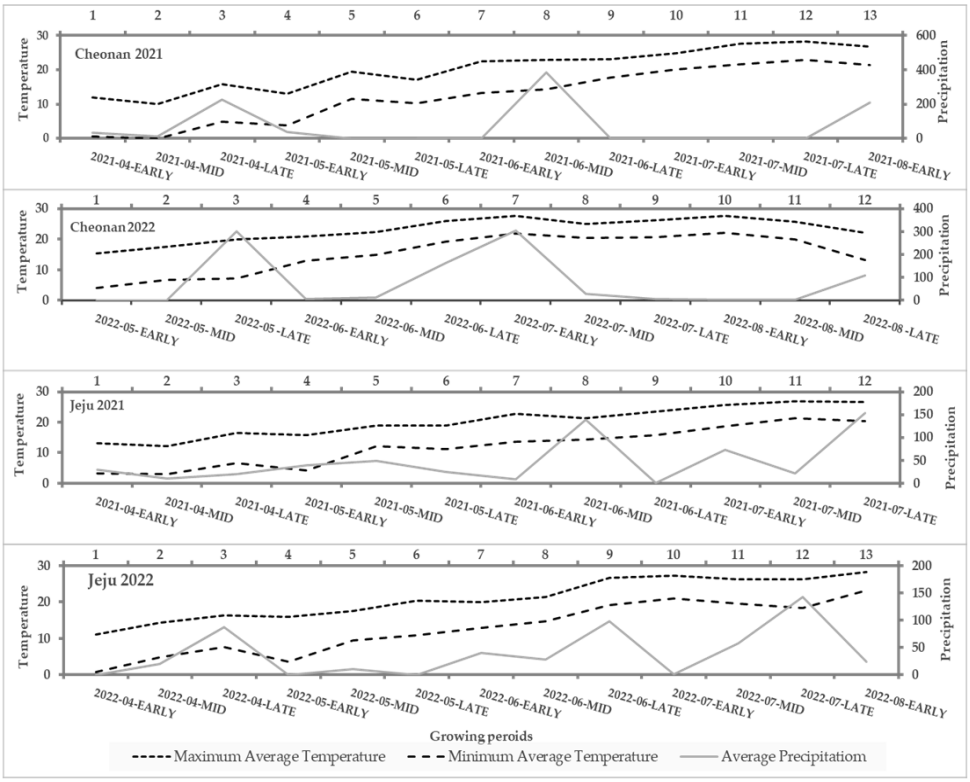


**Fig. 1. Maximum temperature (Tmax), minimum temperature (Tmin), and precipitation level in Cheonan and Jeju in 2021 and 2022. Data were obtained from Korea Meteorological Administration, including average temperature (C), maximum temperature (Tmax), and minimum temperature (Tmin).**

**Table 1. The growth characteristics and productivity of Kwangpyeongok cultivar in different regions between 2021 and 2021**

| Cultivar Name | Cultivated regions | Years | Plant height (cm) | Stem Diameter (mm) | Dry matter yield (kg/ha) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Stover | Corn grain | Total yield |
| Kwangpyeongok | Cheonan | 2021 | 275 ±18$^{a}$ | 21.0 ± 1.9$^{b}$ | 11,147 ± 1420$^{a}$ | 9,567 ± 673$^{a}$ | 20,715 ± 790$^{a}$ |
| | | 2022 | 244 ± 22$^{a}$ | 39.3 ± 33$^{a}$ | 12,066 ±1532$^{a}$ | 9,810 ±1265$^{a}$ | 21,876 ±1128$^{a}$ |
| | | Mean | 259 ± 22$^{a}$ | 30.1 ± 13$^{a}$ | 11,607 ± 1532$^{a}$ | 9,688 ± 1265$^{a}$ | 21,295 ±1128$^{a}$ |
| | Jeju | 2021 | 242 ± 14$^{b}$ | 23.0 ± 1.2$^{a}$ | 10,057 ± 407.0$^{a}$ | 9,552 ± 333$^{a}$ | 19,608 ± 252$^{a}$ |
| | | 2022 | 219 ± 11$^{a}$ | 20.1 ± 1.6$^{b}$ | 10,413 ± 1670$^{a}$ | 9,680 ±1877$^{a}$ | 20,092 ± 518$^{a}$ |
| | | Mean | 230 ± 16$^{a}$ | 21.8 ± 1.5$^{a}$ | 10,235 ±178.0$^{b}$ | 9,616 ± 90.3$^{a}$ | 19,850 ± 342$^{a}$ |

Stem height and stem diameter were determined at yellow-ripening stage according to research analysis criteria for Agriculture and Science Technology (RDA, 2012). Data were presented as the Mean ± Standard Deviation. Alphabets a and b, within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

regions in 2022 is not significantly different. In Jeju, the average stem diameter was higher in 2021, while in Cheonan, the diameter was higher in 2022 ($p$<0.05). Plant and corn grain yields in both cultivated regions did not change significantly between 2021 and 2022 in both regions. The average total dry matter content of the Kwangpyeongok cultivar was slightly higher ($p$>0.05) in Cheonan than in Jeju (Table 1).

### 3. AGR-41 cultivar growth characteristics and yield in Cheonan and Jeju

AGR-41 cultivar stem height was higher in Cheonan in 2021 and 2022 than in Jeju region ($p$<0.05). The stem diameter was greater in Jeju in 2021 ($p$<0.05), but the diameter remained the same in both cultivated regions in 2022. However, the average stem height for two years was higher in Cheonan, but the average stem diameter for two years was higher in Jeju. Cheonan has a significant increase in plant yield in 2021 compared to Jeju ($p$<0.05). Despite this, Jeju's plant yield was slightly higher ($p$>0.05) than Cheonan's in 2022. Jeju's two-year average total plant yield of AGR-41 cultivar was slightly higher ($p$>0.05) than Cheonan's (Table 2).

### 4. Nero IT cultivar growth characteristics and yield in Cheonan and Jeju

In both Cheonan and Jeju, the average stem height of Nero IT cultivar was the same in two years. In 2021, Nero IT cultivar height was higher in Cheonan than Jeju region ($p$<0.05). There is no significant difference in stem height between the two cultivated regions in 2022. The two-year stem height for Cheonan was higher than for Jeju, but the average two-year stem diameter was greater for Jeju. Plant yields in Cheonan and Jeju did not change significantly in 2021 and 2022. However, plant yields increased slightly in Jeju region compared to Cheonan in 2022. The yield of corn grain had not changed significantly in either cultivated region or year. In Jeju, the two-year average plant yield of Nero IT cultivar was higher ($p$>0.05) than in Cheonan (Table 3).

**Table 2. AGR 41 cultivar characteristics and productivity in different regions between 2021 and 2021**

| Cultivar Name | Cultivated regions | Years | Plant height (cm) | Stem Diameter (mm) | Dry matter yield (kg/ha) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Stover | Corn grain | Total yield |
| AGR 41 | Cheonan | 2021 | 287 ± 11$^{a}$ | 20.4 ± 2.3$^{b}$ | 13,893 ± 2531$^{a}$ | 10,744 ± 1263$^{a}$ | 24,637 ± 1574$^{a}$ |
| | | 2022 | 239 ± 18$^{a}$ | 19.9 ± 2.5$^{a}$ | 10,119 ± 3248$^{a}$ | 11,074 ± 27.01$^{a}$ | 21,193 ± 477$^{a}$ |
| | | Mean | 262 ± 34$^{a}$ | 20.2 ± 0.4$^{a}$ | 12,006 ± 2668$^{a}$ | 10,909 ± 233.0$^{a}$ | 22,915 ± 1722$^{a}$ |
| | Jeju | 2021 | 247 ± 7.4$^{b}$ | 24.5 ± 2.5$^{a}$ | 9,342 ± 564.0$^{b}$ | 9,550 ± 518.0$^{a}$ | 18,892 ± 147$^{a}$ |
| | | 2022 | 221 ± 11$^{b}$ | 21.6 ± 2.9$^{a}$ | 15,809 ± 2305$^{a}$ | 12,781 ± 2989$^{a}$ | 28,590 ±2141$^{a}$ |
| | | Mean | 234 ± 18$^{a}$ | 23.0 ± 2.0$^{a}$ | 12,575 ± 4573$^{a}$ | 11,166 ± 2284$^{a}$ | 23,741 ± 4849$^{a}$ |

Stem height and stem diameter were determined at yellow-ripening stage according to research analysis criteria for Agriculture and Science Technology (RDA, 2012). Data were presented as the Mean ± Standard Deviation. Alphabets a & b, within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

**Table 3. Nero IT cultivar characteristics and productivity in different regions between 2021 and 2021**

| Cultivar Name | Cultivated regions | Years | Plant height (cm) | Stem Diameter (mm) | Dry matter yield (kg/ha) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Stover | Corn grain | Total yield |
| Nero IT | Cheonan | 2021 | 279 ± 14$^{a}$ | 20.3 ± 1.9$^{a}$ | 12,615 ± 1821$^{a}$ | 10,147 ± 2001$^{a}$ | 22,762 ± 1745$^{a}$ |
| | | 2022 | 218 ± 17$^{a}$ | 19.0 ± 1.8$^{a}$ | 8,977 ± 255.0$^{a}$ | 9,911 ± 2121$^{a}$ | 18,888 ± 466.0$^{a}$ |
| | | Mean | 248 ± 42$^{a}$ | 19.6 ± 0.8$^{a}$ | 10,796 ± 2572$^{a}$ | 10,029 ± 166.0$^{a}$ | 20,825 ± 1937$^{a}$ |
| | Jeju | 2021 | 240 ± 17$^{b}$ | 24.6 ± 3.3$^{a}$ | 12,809 ± 767.0$^{a}$ | 8,947 ± 596.0$^{a}$ | 21,756 ± 2731$^{a}$ |
| | | 2022 | 211 ± 19$^{a}$ | 20.1 ± 2.5$^{a}$ | 11,621 ± 4837$^{a}$ | 10,010 ± 1866$^{a}$ | 21,631 ± 1139$^{a}$ |
| | | Mean | 226 ± 20$^{a}$ | 22.4 ± 3.1$^{a}$ | 12,215 ± 840.0$^{a}$ | 9,478 ± 752.0$^{a}$ | 21,694 ± 62.30$^{a}$ |

Stem height and stem diameter were determined at yellow-ripening stage according to research analysis criteria for Agriculture and Science Technology (RDA, 2012). Data were presented as the Mean ± standard Deviation. Alphabets a & b, within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

### 5. Nutrient content of cultivars cultivated in Cheonan and Jeju

The neutral detergent fiber (NDF), acid detergent fiber (ADF), and crude protein (CP) in both cultivars and regions were analyzed. Three corn cultivars did not change their nutrient content in any cultivated region in either 2021 or 2022 (Tables 4-6).

## Ⅳ. DISCUSSION

The Korean peninsula is heavily affected by climate change. In South Korea, the average temperature has increased by 1.1°C over the last century (KMA, 2020), and precipitation has also increased by almost 160mm a year (Jung et al., 2011). Furthermore, the trend of longer summers and shorter winters has increased (Government Republic of Korea, 2020). South Korea faces a four

**Table 4. Plant and grain nutrient content of the Kwangpyeongok cultivar in different regions in 2021 and 2022**

| Locations | year | Stover nutrient (%) | | | Grain nutrient (%) | | |
|---|---|---|---|---|---|---|---|
| | | NDF | ADF | CP | NDF | ADF | CP |
| Cheonan | 2021 | 65.5 ± 5.6[a] | 36.0 ± 3.7[a] | 6.6 ± 1.4[a] | 24.5 ± 2.2[a] | 7.33 ±1.2[a] | 8.51 ± 0.6[a] |
| | 2022 | 60.9 ± 5.3[a] | 33.3 ± 3.9[a] | 8.0 ± 0.6[a] | 27.4 ± 2.8[a] | 10.2 ± 4.8[a] | 9.40 ± 0.4[a] |
| | Mean | 63.2 ± 3.2[a] | 34.6 ± 1.9[a] | 7.3 ± 1.0[a] | 25.9 ± 2.0[a] | 8.70 ± 2.0[a] | 8.96 ± 0.6[a] |
| Jeju | 2021 | 61.3 ± 0.5[a] | 34.3 ± 1.2[a] | 5.7 ± 0.29 | 24.9 ± 3.2[a] | 7.35 ± 2.3[a] | 8.29 ± 0.6[a] |
| | 2022 | 57.9 ± 3.4[a] | 30.5 ± 2.2[a] | 5.6 ± 1.8[a] | 26.0 ± 5.0[a] | 8.53 ± 4.0[a] | 8.69 ± 0.2[a] |
| | Mean | 59.6 ±2.3[a] | 32.4 ± 2.6[a] | 5.6 ± 0.07[a] | 25.4 ± 0.7[a] | 7.94 ± 0.8[a] | 8.49 ± 0.6[a] |

Data were presented as the Mean ± standard Deviation. NDF: Neutral detergent fiber; ADF: Acid detergent fiber; CP: Crude protein. Alphabets within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

**Table 5. Plant and grain nutrient content of the AGR-41 cultivar in different regions in 2021 and 2022**

| Locations | Cultivation year | Stover nutrient (%) | | | Grain nutrient (%) | | |
|---|---|---|---|---|---|---|---|
| | | NDF | ADF | CP | NDF | ADF | CP |
| Cheonan | 2021 | 66.2 ± 4.0[a] | 37.0 ± 3.0[a] | 6.44 ± 0.7[a] | 22.4 ± 3.3[a] | 5.38 ± 1.0[a] | 8.67 ± 0.4[a] |
| | 2022 | 62.1± 6.4[a] | 33.7± 4.7[a] | 8.06 ± 0.8[a] | 25.3± 5.2[a] | 8.00 ± 3.0[a] | 9.86 ± 0.4[a] |
| | Mean | 64.2± 2.9[a] | 35.4± 2.3[a] | 7.25 ± 1.1[a] | 23.8± 2.0[a] | 6.69 ± 1.8[a] | 9.27 ± 0.8[a] |
| Jeju | 2021 | 60.0 ± 0.8[a] | 32.7 ± 0.3[a] | 4.84 ± 0.4[a] | 23.6± 2.9[a] | 5.37 ± 0.9[a] | 7.93 ± 0.5[a] |
| | 2022 | 56.0 ± 1.8[a] | 29.9 ± 0.7[a] | 5.70 ± 0.4[a] | 26.3± 1.9[a] | 8.76 ± 1.1[a] | 8.79 ± 1.1[a] |
| | Mean | 58.0 ± 2.8[a] | 31.3± 1.9[a] | 5.44 ± 0.4[a] | 24.9 ± 1.9[a] | 7.07 ± 2.4[a] | 8.36 ± 0.6[a] |

Data were presented as the Mean ± standard Deviation. NDF: Neutral detergent fiber; ADF: Acid detergent fiber; CP: Crude protein. Alphabets within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

**Table 6. The nutrient content of Nero IT cultivar corn plants and grains in 2021 and 2022 in different regions**

| Locations | Cultivation year | Stover nutrient (%) | | | Grain nutrient (%) | | |
|---|---|---|---|---|---|---|---|
| | | NDF | ADF | CP | NDF | ADF | CP |
| Cheonan | 2021 | 63.1 ± 3.6[a] | 35.2 ± 0.6[a] | .6.4 ± 0.9[a] | 26.0 ± 1.5[a] | 7.62 ± 1.5[a] | 8.70 ± 0.7[a] |
| | 2022 | 60.9 ± 5.0[a] | 32.2 ± 3.0[a] | 6.76 ± 0.5[a] | 26.8 ± 1.2[a] | 7.17 ± 1.9[a] | 9.21 ± 0.2[a] |
| | Mean | 62.0 ± 1.5[a] | 33.7 ± 2.0[a] | 6.58 ± 0.3[a] | 26.4 ± 0.4[a] | 7.40 ± 0.2[a] | 8.96 ± 0.3[a] |
| Jeju | 2021 | 57.8 ± 0.9[a] | 31.9 ± 0.9[a] | 6.68 ± 0.9[a] | 22.9 ± 1.0[a] | 6.87 ± 0.9[a] | 9.06 ± 0.2[a] |
| | 2022 | 58.5 ± 6.4[a] | 30.8 ± 3.9[a] | 6.18 ± 0.8[a] | 24.6 ± 6.6[a] | 8.04 ± 3.1[a] | 8.50 ± 0.5[a] |
| | Mean | 58.1 ± 0.5[a] | 31.4 ± 0.7[a] | 6.43 ± 0.3[a] | 23.8 ± 0.8[a] | 7.47 ± 0.6[a] | 8.78 ± 0.3[a] |

Data were presented as the Mean ± standard Deviation. NDF: Neutral detergent fiber; ADF: Acid detergent fiber; CP: Crude protein. Alphabets within a column, indicating significant differences ($p$<0.05) between Cheonan and Jeju regions.

to six-year cycle of extreme drought and rainfall events, causing extreme heat waves (Oh et al., 2017) and flooding under the east Asian monsoon conditions, including total annual precipitation, daily maximum rainfall, and drought duration. If greenhouse gases continue to be released at their current level, the severity of drought is projected to be spatially variable and occurrences are likely to increase (Sung et al., 2018; Choi et al, 2019; Van Doi and Kim, 2020). A change in climate could impact crop production and variability. The present study cultivated different types of corn cultivars including Kwangpyeongok, AGR-41, and Nero IT in different regions of Korea with varying environmental conditions, including Cheonan and Jeju. In both regions, stem height, diameter, plant and ear yield, and total dry matter yield were measured for the Kwangpyeongok cultivar. In 2021, all cultivars in Cheonan had higher stem heights than in Jeju. However, both cultivated regions had similar average plant, corn grain, and total yields in 2021 and 2022. The average yield of cultivar AGR 41 in Cheonan is significantly higher than in Jeju. In 2021 and 2022, Jeju's corn grain yield and total dry matter content were slightly higher than Cheonan. In Jeju, the average total plant yield (Stover and grain) was slightly higher than in Cheonan for cultivar Nero IT. However, Cheonan had more corn grain yield than Jeju on average. While total precipitation was lower in Jeju than in Cheonan in 2021 (568 mm vs 870 mm) and 2022 (508 mm vs 940 mm). The plant growth, grain yield, and total plant yield of all three cultivars in Jeju were almost similar or slightly higher than in Cheonan. Cultivar AGR-41 total plant yield showed more differences between 2021 and 2022. The year of 2021 saw slightly higher precipitation than the year of 2022, but the total plant yield was lower in 2021. This indicates that higher precipitation might affect corn productivity. The Cheonan average daily maximum temperatures in 2021 and 2022 were 20.6°C and 23.05°C, respectively. It is higher than that in Jeju, which had daily maximum temperatures of 20.1 and 20.9 in 2021 and 2022, respectively. Compared to Jeju in the same years, Cheonan had higher temperature ranges from 0.5°C and 3°C in 2021 and 2022, which may explain a slight reduction in corn productivity, despite higher precipitation and uneven precipitation days in Cheonan. Increased maximum temperatures cause water stress, reducing photosynthetic activity, and negatively affecting antioxidant enzymes in corn plants (Gong et al., 1997; Dhakhwa et al., 1998; Ben-Asher et al., 2008).

Overall data suggested that there were different cultivars of corn cultivated in different climate regions such as Cheonan and Jeju, including Kwangpyeongok, AGR-41, and Nero IT. Kwangpyeongok cultivar total dry matter content was slightly higher in Cheonan, while AGR-41, and Nero IT total dry matter content were slightly higher in Jeju. There were higher total precipitation levels and daily average maximum temperatures in Cheonan than in Jeju. This study indicates that cultivars can exhibit distinct characteristics and growth productivity in different regions, but the average two-year production of cultivars (AGR-41, and Nero IT) from Jeju was slightly higher than that of Cheonan.

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