RESPONSE OF SNAPBEAN AND POTATO GERMPLASM TO LOW TEMPERATURE IN BENGUET, PHILIPPINES

Belinda A. Tad-awan, Charlotte C. Shagol, Esther Josephine D. Sagalla, Janet P. Pablo, Guerzon A. Payangdo

Higher Education Regional Research Center
Department of Agronomy, College of Agriculture
Benguet State University, La Trinidad, Benguet, Philippines

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Rationale

- Benguet, Philippines as top producers of temperate vegetables: potato, cabbage, snapbean, and tomato

Rationale

2nd cropping

1st cropping

Climate data for Benguet													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average precipitation mm (inches)	150.8 (5.937)	101.8 (4.008)	82.3 (3.24)	44.9 (1.768)	132.5 (5.217)	146 (5.75)	196.9 (7.752)	181.6 (7.15)	168.5 (6.634)	199.2 (7.843)	191.2 (7.528)	233.7 (9.201)	1,829.4 (72.028)
Average rainy days	2	3	6	9	19	21	26	26	23	14	9	5	163
Average high °C (°F)	23.1 (73.6)	23.9 (75)	24.7 (76.5)	25.3 (77.5)	24.6 (76.3)	24.1 (75.4)	22.9 (73.2)	22.5 (72.5)	23 (73)	23.6 (74.5)	23.8 (74.8)	23.3 (73.9)	23.73 (74.68)
Average low °C (°F)	13.3 (55.9)	13.9 (57)	14.8 (58.6)	16.2 (61.2)	16.7 (62.1)	16.6 (61.9)	16.4 (61.5)	16.6 (61.9)	16.3 (61.3)	16 (61)	15.5 (59.9)	14.2 (57.6)	15.54 (59.9)
Source #1: *Storm247* (for average temperature and rainy days)													
Source #2: *WorldWeatherOnline* (for average precipitation)													

Rationale

- Low temperature from December to February may result in “frost” in the high elevation vegetable producing areas
- Tolerance to low temperature is a significant prerequisite for optimal yield performance of vegetables
- Reproductive stage is the most sensitive phenological stages to temperature extremes across all species (Hatfield and Prueger, 2015)
- Evaluation of cold tolerant germplasm may provide opportunity for Benguet farmers to produce crop thus, adaptability trials are necessary to identify germplasm that performs well under cool environments

Objectives

- The study evaluated the responses of potato and snapbean germplasm to low temperature in Benguet, Philippines

Methodology

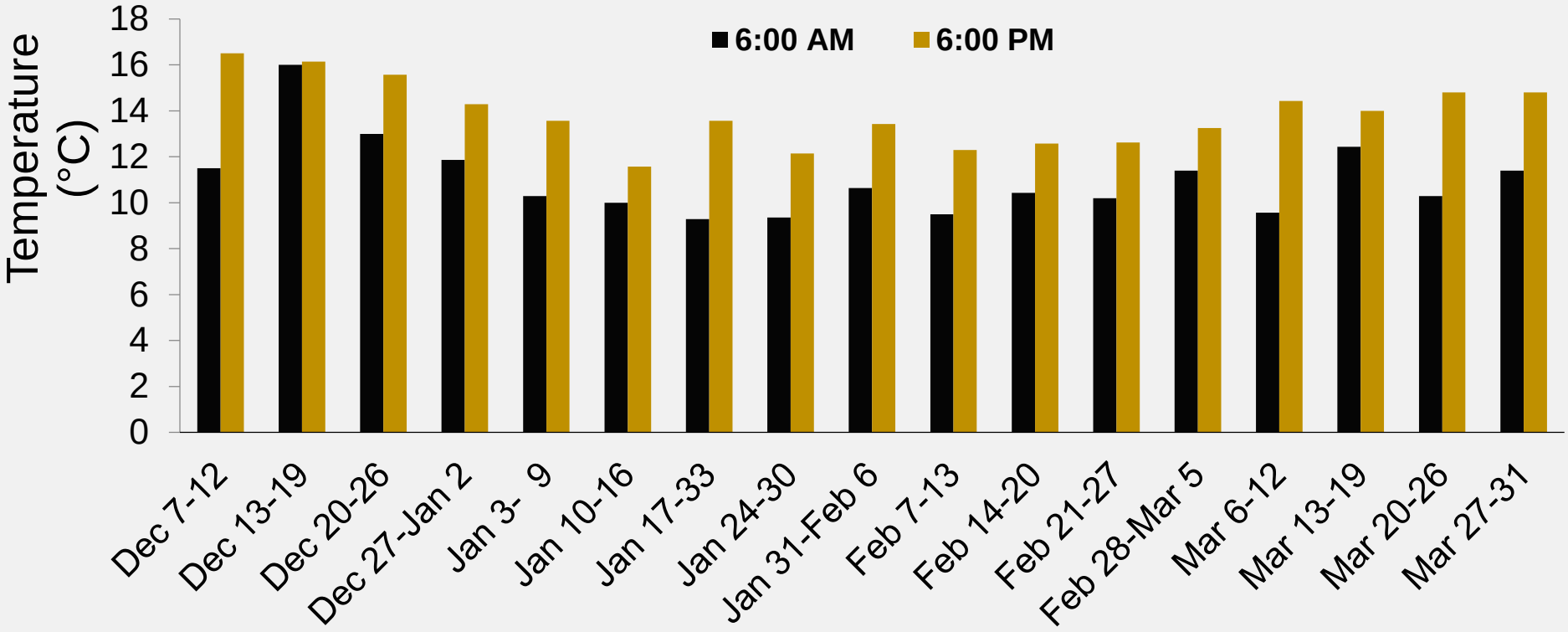
Planting material

- **Bush bean:** 10 varieties
- **Potato:** 10 varieties

Experimental site and design

- Sayapot, Balili, Mankayan, Benguet
- 1,658 m asl
- 3 reps
- 1 x 5m^2 plots
- RCBD

Figure 1. Temperature during the conduct of the study at Sayapot, Balili, Mankayan, Benguet, Philippines (1,658 m asl).



Temperature range during the conduct of the study:

AM: 9.5 to 16.0
PM: 11.5 to 16.5

Optimum Temperature requirements:

Beans: 18-29°C
Potato: 17-22 °C

- Sowing date: November 26, 2015

Study 1. Growth and yield of bush bean varieties under low temperature condition in Benguet, Philippines

Stunted plants

Low number of pods per plant

Study 2. Growth and Yield of Potato entries under Low Temperature Condition

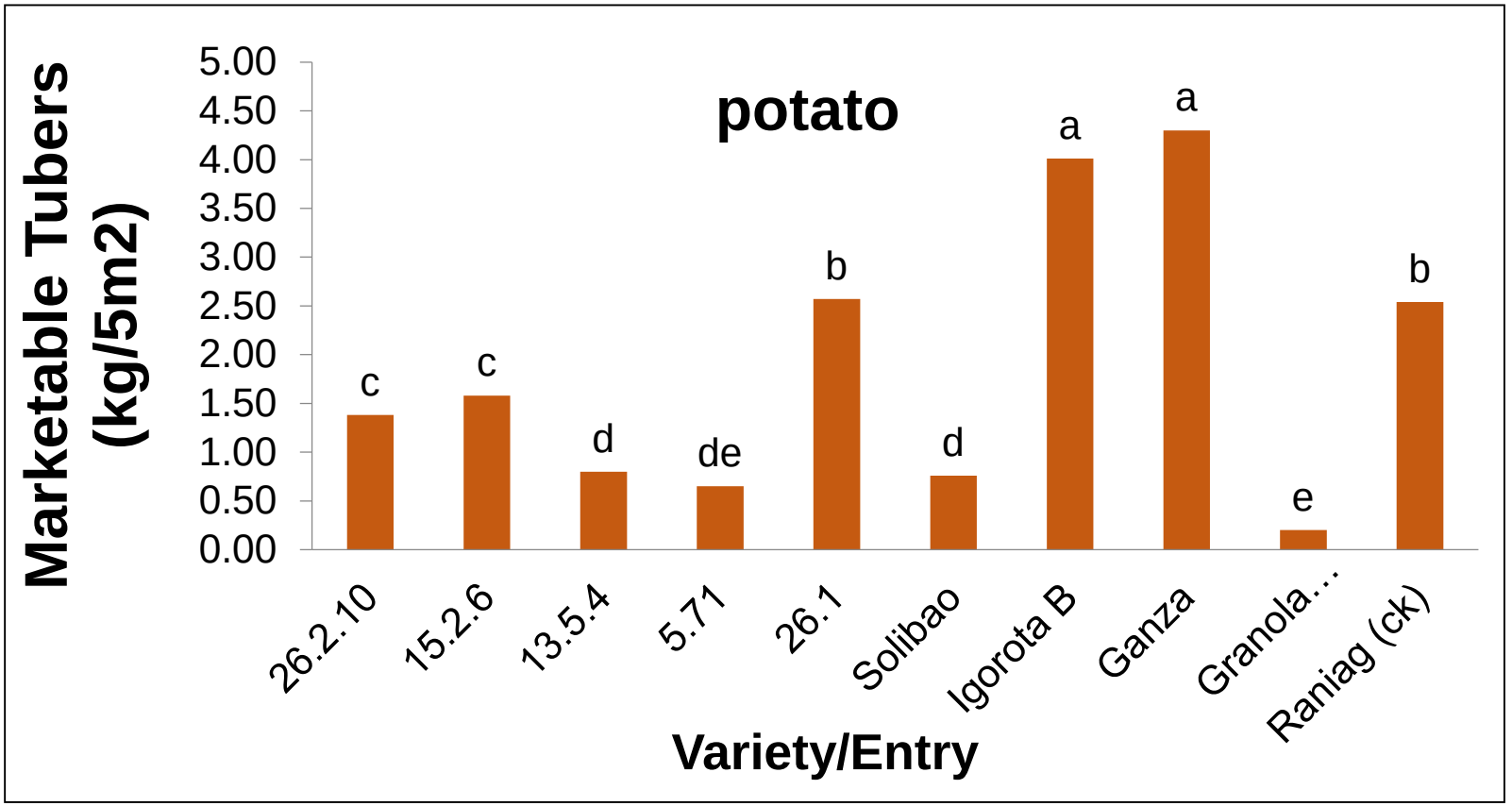
Table 4. Canopy cover, total yield per plot, and harvest index of the ten potato entries grown under low temperature condition

ENTRY	PLANT SURVIVAL (%)	CANOPY COVER (DAP)		
		30	45	60
26.2.10	87	37^{c}	39^{bc}	39^{c}
15.2.6	84	36^{b}	40^{b}	50^{b}
13.5.4	95	32^{b}	40^{b}	35^{b}
5.71	91	22^{d}	25^{d}	30^{d}
26.1	98	45^{b}	50^{b}	56^{b}
Solibao	80	21^{cd}	26^{cd}	19^{cd}
Igorota B	89	57^{a}	63^{a}	61^{a}
Ganza	100	56^{a}	63^{a}	68^{a}
Granola	86	17^{d}	16^{d}	13^{d}
Mexican Raniag (ck)	91	41^{b}	47^{b}	54^{b}
CV (%)		16.6	19	20.4

Means with the same letter are not significantly different at 0.05 level by LSD.

- **Potato tuber initiation: 40-45 DAE**
- **Tuberization and bulking: 30 to 50 days**
- **Harvesting: 70-90 DAE**

Figure 2. Yield of potato varieties/entries grown under low temperature in Benguet, Philippines



Tuber yield: 17 to 20 tons ha^{-1}

Yield reduction: 50 to 75% tuber yield reduction

Potato

Stunted growth

Late Blight

Implication

- Production of potato and bush bean during the months that coincide with low temperature results in low yield (50 to 75% yield reduction)

- Bushbean entries Red bean and Lipstican produced better yield
- Ganza and Igorota potato varieties gave higher yield under low temperature stress

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Thank you for listening

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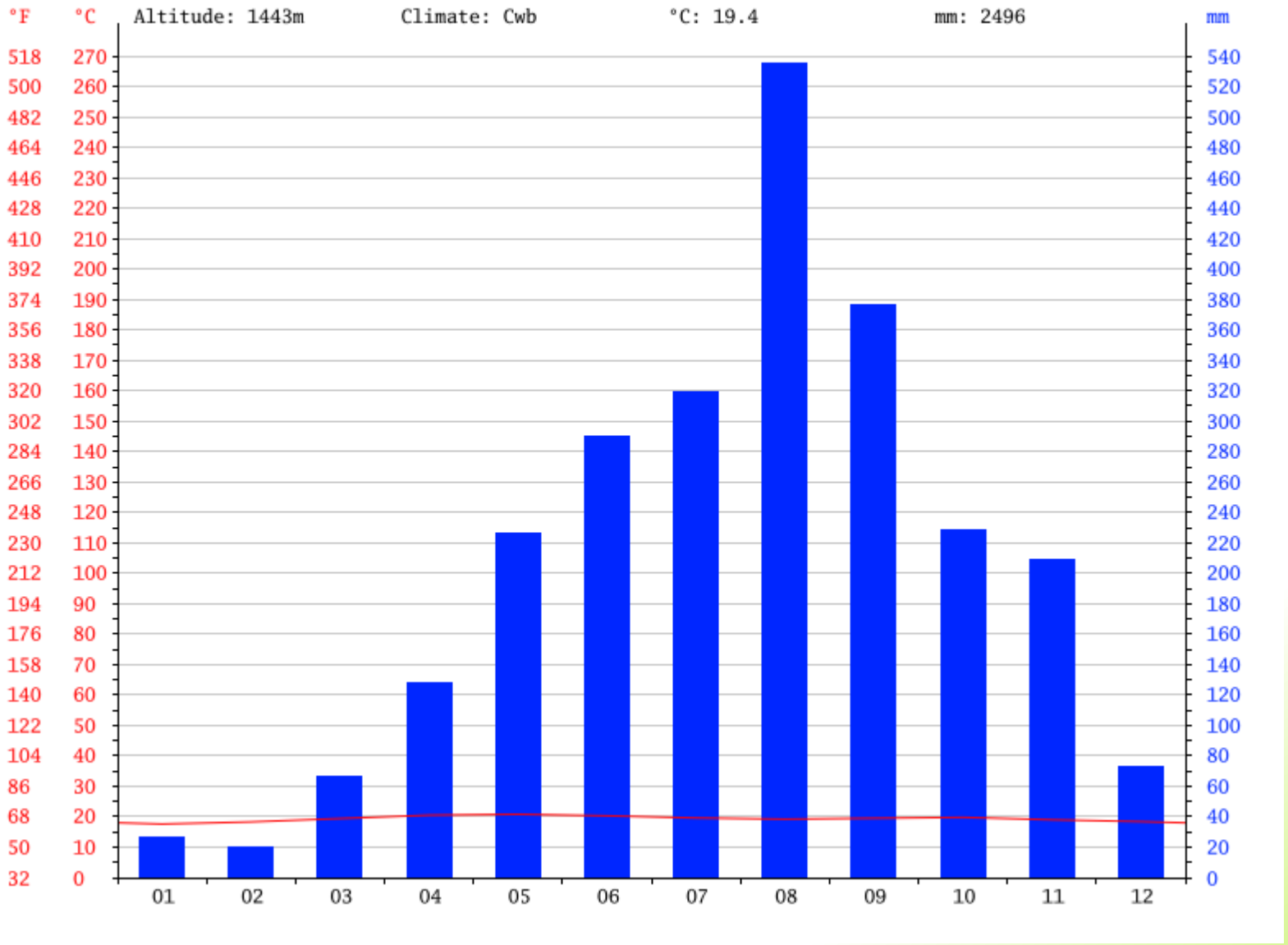
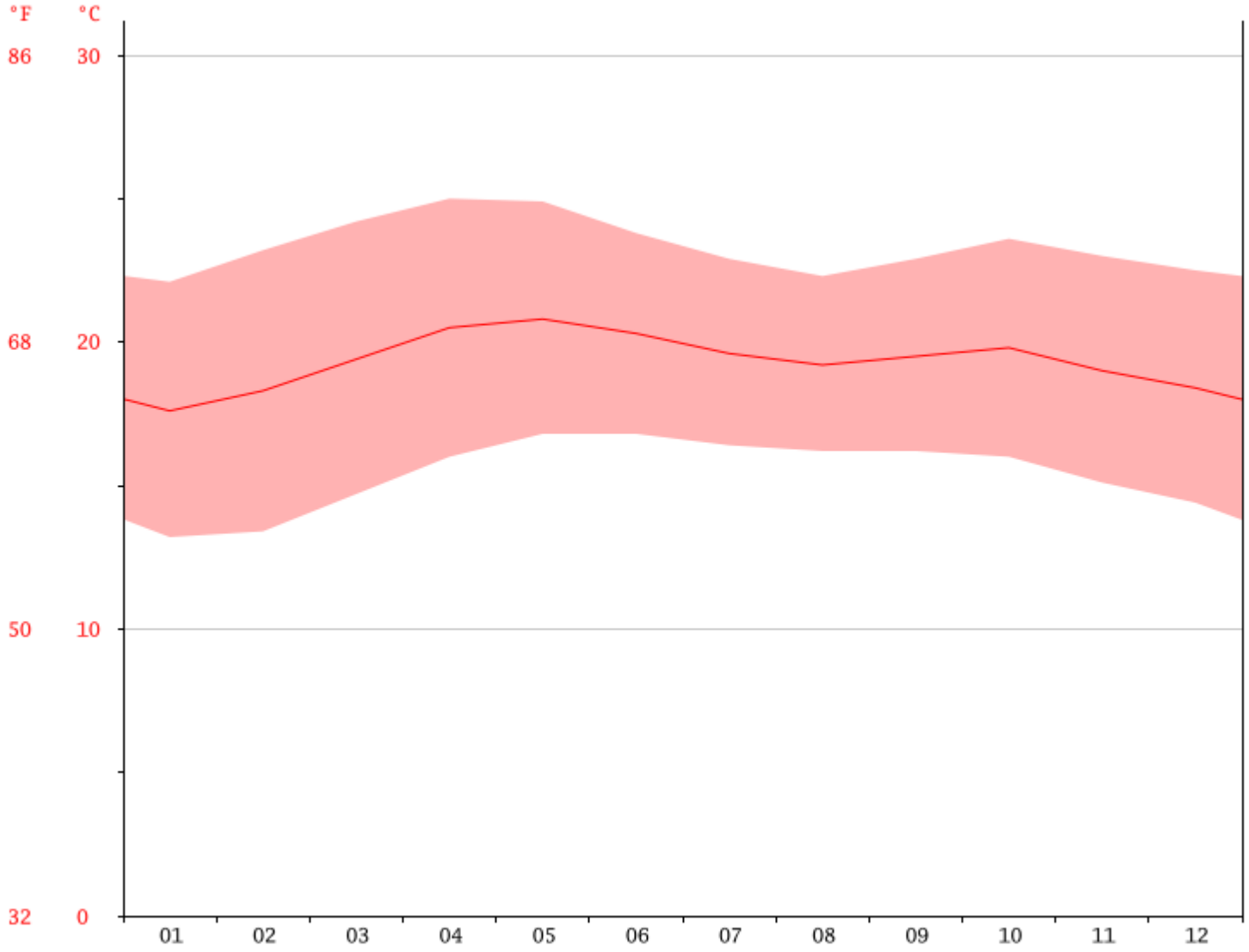


February - driest month, 20 mm of precipitation,
August - an average of 535 mm, the most precipitation



May – warmest month, an average of 20.8 °C
January - lowest average temperature of the year, 17.6 °C

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	17.6	18.3	19.4	20.5	20.8	20.3	19.6	19.2	19.5	19.8	19	18.4
Min. Temperature (°C)	13.2	13.4	14.7	16	16.8	16.8	16.4	16.2	16.2	16	15.1	14.4
Max. Temperature (°C)	22.1	23.2	24.2	25	24.9	23.8	22.9	22.3	22.9	23.6	23	22.5
Avg. Temperature (°F)	63.7	64.9	66.9	68.9	69.4	68.5	67.3	66.6	67.1	67.6	66.2	65.1
Min. Temperature (°F)	55.8	56.1	58.5	60.8	62.2	62.2	61.5	61.2	61.2	60.8	59.2	57.9
Max. Temperature (°F)	71.8	73.8	75.6	77.0	76.8	74.8	73.2	72.1	73.2	74.5	73.4	72.5
Precipitation / Rainfall (mm)	26	20	66	128	226	290	319	535	376	228	209	73

The precipitation varies 515 mm between the driest month and the wettest month. During the year, the average temperatures vary by 3.2 °C