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Sweet corn windbreaker's effect on microweather changes and increases growth and yield of water spinach (*Ipomoea reptans* Poir.) on the Samas coastal sandy land

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Abstract

High wind speed is one of the limiting factors for plant cultivation in coastal sandy land. To mitigate this, sweet corn, an annual plant, can be cultivated as a windbreaker. Water spinach is one of the short-lived plants cultivated by farmers in coastal sandy land. The study aimed to figure out the microweather change, growth, and yield of water spinach protected by sweet corn as windbreaker in various planting locations in Samas coastal sandy land. The research had been conducted in Samas coastal sandy land, Bantul Regency, Yogyakarta Special Region, from October to November 2022. The experiment was arranged in Randomized Complete Block Design non-factorial, containing five treatment levels and four repetitions. The treatment of the planting location of sweet corn as a windbreaker is without sweet corn, sweet corn positioned on the "east", sweet corn on the "east and west", sweet corn on the "south", and sweet corn on the "south and north". The data were analyzed using analysis of variance (ANOVA), and if the difference was marked, the data analysis was proceeded to Tukey HSD with α = 5%. The results showed that sweet corn windbreaker placed on the "east" was the most effective in decreasing wind speed, thereby modifying the microweather of water spinach plot by lowering air temperature and increasing air humidity and soil moisture content during November on the Samas coastal sandy land. Growth, dry matter accumulation, and water spinach yield increased, although the dry harvest index and fresh harvest index did not show any improvement.

INTRODUCTION

Coastal sandy land, categorized as marginal land, offers an alternative for agriculture to face the shrinking availability of agriculture land due to industrial development, population growth, housing need, and other factors. Although coastal sandy land offers its potential for land availability due to its large dan flat surface, abundant sunlight, and shallow water surface (Setyaningrum et al., 2019), one of its limiting factors that harms plant growth and yield is the high wind speed. In coastal sandy land, high wind speed can reach 6.2 $m.s^{-1}$ (Nurhayati et al., 2019). High wind speed contributes to increased evaporation rates and can potentially transport salt particles (Sukri et al., 2018). High evaporation impacts drought stress or low water availability for plants, which can lead to wilting. Strong wind can also damage plants, either directly or indirectly, including abrasion or rubbing between plant parts, leaf tearing, loss of leaves or branches, and twisting stems (Gardiner et al., 2016). In addition, high wind speed also affects the microweather of plants. Dai et al. (2015) stated that high wind speed raises the air temperature.

A windbreaker is a barrier, which can be a plant, grass, wooden fences, or other materials, to reduce wind speed. Sweet corn is an annual crop that can serve as a windbreaker, reducing wind speed on agricultural land and modifying microweather to create conditions more favorable for plant growth.

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Sweet corn is taller than water spinach, about 60 to 150 cm, so it can be selected as a windbreaker to minimize the wind speed entering agriculture land (Astutik et al., 2020). Windbreaks using plants are expected to modify microweather, transforming it from conditions unsuitable for plant growth into a more favorable environment. Windbreakers can directly reduce wind speed in an environment, affecting the temperature and humidity (Dheng et al., 2011). Sun et al. (2022) reported that the wind speed outside the windbreak trees is higher than in protected areas. Outside the windbreak, the wind speed exceeds 14–16 $m.s^{-1}$ while in protected areas, it is only 4 $m.s^{-1}$. According to Astutik (2017), sweet corn as a shelter, or windbreaker, surrounding green beans results in higher air temperature and lower air humidity than outside the plot.

Using sweet corn as a shelter at a density of 15 cm x 40 cm could increase the dry weight of green bean leaves 6 weeks after planting (WAP). In addition, the total dry weight of green bean varieties Vima 1 and Local Purworejo at 6 WAP increased when sweet corn served as shelters (Astutik et al., 2017). The medium density (15 cm) of sweet corn as a shelter could increase the root length of green beans of the Vima 1 variety. However, the root length of green beans of the Local Purworejo variety increases if the density of sweet corn as a shelter is high (30 cm). Green beans are reported to have increased root surface area when sheltered by low-density and high-density sweet corn (Astutik et al., 2020). Kaur et al. (2014) reported that the use of white plastic as a windbreaker led to the highest eggplant yield (428.36 $kg.Ha^{-1}$), followed by black plastic (420.58 $kg.Ha^{-1}$), and woven bamboo (299.61 $kg.Ha^{-1}$), compared to controls (281.43 $kg.Ha^{-1}$).

Water spinach (*Ipomoea reptans* Poir.) is one of various plants that have been cultivated in coastal sandy land by farmers due to its great demand in the community, both on a household scale and a restaurant scale. Water spinach is a short-lived plant, so farmers can increase their income while waiting for the harvest period. Through this research, planting sweet corn was expected to be a windbreaker to create a better-growing environment for water spinach in coastal sandy land so that the water spinach growth and yield were more optimal than the water spinach environment without sweet corn as a windbreaker. Based on Firdaus et al. (2022), wind could change direction depending on time of day. Sweet corn as a windbreaker was evaluated at several different planting locations to determine which location exerted the best influence. The study aimed to figure out the microweather change, growth, and yield of water spinach protected by sweet corn as windbreaker in various planting locations on the Samas coastal sandy land.

MATERIALS AND METHODS

The research had been conducted on the Samas coastal sandy land, Bantul Regency, Yogyakarta Special Region, from October to November 2022. It is located at the altitude of 33.8 meters above sea level. The daily air temperature ranges from 32°C to 34°C and can reach 38°C during the day. Daily wind speeds vary from 1.2 $m.s^{-1}$ to 2.6 $m.s^{-1}$. Sweet corn used as a windbreaker was the residue from the first main crop, eggplant. After harvesting the eggplant, sweet corn stalks were left in the field to assess their impact on water spinach plants as a windbreaker. The materials used were water spinach from Bangkok LP 1 variety as the main crop and sweet corn from Sweet Boy variety as the windbreaker. Research procedures included tilling, planting, fertilizing, maintenance, sampling, observation, and harvesting.

The study was arranged in a Randomized Complete Block Design, with five levels of sweet corn planting locations as windbreakers, with each treatment repeated four times. The level of treatment included without sweet corn as a windbreaker, sweet corn as a windbreaker positioned on the "east", sweet corn as a windbreaker on the "east and west", sweet corn as a windbreaker on the "south", and sweet corn as a windbreaker on the "south and north". Sweet corn as a windbreaker was evaluated in various planting locations because wind direction can change depending on time of day. Wind consists of land wind, which moves from land to sea, and sea wind, which moves from sea to land. These winds alternate direction every half a day, shifting between day and night. The plot size for sweet corn was 0.5 m x 4 m to produce an area of 2 m^2. The planting distance of sweet corn as a windbreaker was 15 cm x 40 cm. Water spinach was planted in polybags measuring 30 x 30, with eight polybags per plot. Planting media was sand from the surrounding land. Each polybag had four water spinach plants. The plot size for water spinach plants was 0.5 m x 1.5 m to produce an area of 0.75 m^2. The distance between the water spinach plot and the sweet corn was 50 cm.

Data were analyzed using Analysis of Variance (ANOVA) Tukey-HSD at the α = 5% test level to find the difference between treatments. Data were analyzed using SAS software.

Microweather

Microweather analysis observations included light intensity, wind speed, air humidity, air temperature, which were recorded seven times at 4, 8, 12, 16, 20, 24, and 28 days after planting. Soil moisture content was measured two times, at 12 and 20 days after planting. Wind speed was observed using an anemometer. Air humidity was observed using a hygrometer. The air temperature was observed using a thermometer. Soil moisture content was obtained using gravimetric methods. Ten grams of polybag sand samples were weighed as fresh weight (a). The sand sample was then heated in an oven to an absolute dry weight (b). The grade of soil moisture content was obtained using the following formula: Soil moisture content (%) = ((a-b)/b) x 100%

Root length (cm), root surface area (cm^2), leaf surface area (cm^2)

Root length, root surface area, and leaf surface area were obtained on the 20th and 32nd day after planting (DAP) of water spinach using an area measuring device that applies the scanner method. The numbers on the monitor were the size of the area and length.

Dry weight of roots, shoots, and total plant (g)

The dry weight of the roots, shoot, and entire plant was measured at 20 and 32 days after planting water spinach. The dry weight of the plant sample was figured out after drying in the oven at 80°C for 48 hours or until the dry weight was constant (grams). All the plants, including roots, shoots, and the whole plant were weighed.

Plant growth analysis

Net assimilation rate (NAR) = (W2-W1)/(T2-T1) - (lnLa2-lnLa1)/(La2-La1) $g.dm^{-2}.day^{-1}$; Relative growth rate (RGR) = (LnW2-LnW1)/(T2-T1) $g.day^{-1}$; Leaf area ratio (LAR) = La/W $dm^2.g^{-1}$; Specific Leaf Weight (SLW) = Lw/La $g.dm^{-2}$; Root Shoot Ratio (RSR) = Wr/Ws; and Dry harvest index (DHI) = We/W.

Water spinach plants were harvested on the 32nd day after planting. The harvest of water spinach was calculated as the yield per plant.

Fresh harvest index (FHI) = Fe/F (Parwada et al., 2020).

Remarks: La = leaf surface area (cm^2), Lw = dry weight of leaves (g), We= economical dry weight (g), W = Total dry weight (g), Wr = dry weight of roots (g), Ws = dry weight of shoots (g), T = time, Fe = economical fresh weight (g), and F = total fresh weight (g).

RESULTS AND DISCUSSION

Windbreaker using sweet corn did not affect the light intensity of the water spinach plot (Table 1). It means water spinach plots tend to receive the same light intensity, with windbreakers or without windbreakers. Sweet corn windbreaker did not exert a shading influence on the protected plot as the shoot grew vertically. Applied windbreakers using sweet corn could reduce wind speed (Table 1), with sweet corn on the “east” as the most effective windbreaker to reduce wind speed. Adding a sweet corn windbreaker on both the front and back sides of the water spinach plot (east and west) reduced the wind speed as effectively as the windbreaker placed only on the “east” side. During the water spinach growing period in November, the wind generally came from the east, either in the morning, afternoon, or evening. Sweet corn windbreakers placed on the “east” could block the arrival of winds that generally came from the east, while those on the west did not affect simultaneously. Windbreakers were effective when faced perpendicular to the direction of the coming wind. This is in line with Shin et al. (2013) who stated that wind-fixing plants planted around plants was an effective barrier to reducing wind speed.

When the wind came from the east, or parallel to the location of sweet corn windbreaker placed on the “south” and “south and north”, sweet corn windbreakers in both locations could not cut the wind properly. However, the direction of wind shifted to the southwest between the 20th and 28th days after planting, generally in the evening. As a result, sweet corn windbreaker positioned on the “south” or “south and north” could also reduce the wind speed, although it was still less effective than a windbreaker placed on the "east" or "east and west". Windbreakers could also lower wind speeds on the lower side behind trees than in the open area, like in Florida citrus plantations (Tamang et al.,

Table 1. Micro weather water spinach plot in various planting locations of sweet corn as windbreakers

Planting location of sweet corn	Light intensity (lux)	Wind speed ($m.s^{-1}$)	Air humidity (%)	Temperatures (°C)	Soil moisture content (%)
Without	73,491.21 a	1.35 a	55.96 c	35.26 a	7.93 c
East	69,748.58 a	0.88 c	58.93 ab	34.30 bc	10.85 a
East and west	70,745.51 a	0.82 c	59.40 a	34.18 c	11.89 a
South	71,631.02 a	1.07 b	57.67 abc	34.77 ab	9.23 b
South and north	72,676.02 a	1.08 b	57.08 bc	34.96 a	9.53 b
Mean	71,658.47	1.04	57.81	34.69	9.89
CV (%)	3.39	3.69	3.24	1.63	5.56

Remarks: Numbers followed by the same letter in the column do not differ markedly in Tukey HSD α = 5%.

2010). The wind speed at a tree distance of 3 m from corn was lower than a tree distance of 10 m from corn, which is 17–36% during the day (Iwasaki et al., 2019). In addition, Sun et al. (2022) reported that the wind speed outside the windbreaker tree plants exceeded 14–16 $m.s^{-1}$ while the wind speed in the protected area was only 4 $m.s^{-1}$.

Water spinach plot air humidity increased with the planting sweet corn windbreakers (Table 1), where sweet corn windbreakers placed on the "east" and "east and west" were the most effective to increase air humidity. The air humidity of water spinach plots with windbreakers positioned on the "east and west" tended to be slightly higher than that of water spinach plots with windbreakers on the "east". When the windbreaker was placed on the "south" and "south and north", the air humidity reduced slightly compared to the windbreaker on the "east" as well as "east and west". Thevs et al. (2017) stated that wind speed decreases as it is blocked by plants, which in turn increases air humidity more than areas outside plant barriers.

Sweet corn plants as windbreakers could reduce the average air temperature of water spinach plots (Table 1). Sweet corn placed on the "east" as well as "east and west" effectively lowered the air temperature. The air temperature reduced the concurrent with reducing the wind speed as it was blocked by plants (Thevs et al., 2017). The water spinach plot soil moisture content could be increased by sweet corn plants as the windbreakers throughout the location (Table 1). Sweet corn windbreaker on the "east" as well as "east and west" were the most effective locations to increase soil moisture content. Meanwhile, windbreakers on the "south" or "south and north" could also increase the soil moisture content, but the increase was smaller than those on the "east" or "east and west". Windbreakers reduce wind speed and, at the same time, increase soil moisture in protected plots (Zhuang et al., 2017).

Based on the study result, sweet corn as a windbreaker, especially those planted on the "east" side, could modify the water spinach microweather planted in November. As the wind generally came from the east, sweet corn windbreaker positioned on the "east" slowed down the wind entering the water spinach plot, thereby affecting other microweather, such as air humidity, air temperature, and soil moisture levels. This refers to Tamang et al. (2010) that windbreakers facing perpendicular to the direction of wind can reduce wind speed and modify microweather, leading to an increase in crop production. According to Martin et al. (2010), decreased wind speed would reduce the amount of water vapor blown into the protected plots, resulting in an increase in air humidity. The increase in air humidity was caused by a decrease in the frequency of high winds, which influenced the reduction of the effect of wind-blowing water vapor (Zhuang et al., 2017).

As moisture in the water spinach plots protected by sweet corn on the "east" increased, the air temperature became cooler, so the air temperature decreased. This was because the slower wind speed would reduce the turbulent mixing of air with air temperature, thereby decreasing the air temperature in the protected plot (Zheng et al., 2016). Because the incoming wind in protected areas was reduced by windbreaker on the "east", the moisture transfer from the soil reduced, ultimately increasing the availability of soil moisture content to plants. According to Zheng et al. (2016), windbreakers directly decrease wind speed, which in turn reduces turbulent air mixing. This leads to a reduction in evaporation which increases soil moisture.

On the 30th day after planting water spinach, the location of sweet corn plants as a windbreaker increased the root length and surface area of water spinach roots (Table 2). Applied windbreakers on the "east", "east and west", and "south" could increase the length of water spinach roots. The same effect was seen in the surface area of water spinach roots, where sweet corn, as a windbreaker planted on the "east", could increase the surface area of water spinach roots (Table 2). The longer the root, the better the plants can absorb water and nutrients because its range will be more comprehensive. In addition, the surface area of the roots can show the effectiveness of root uptake and nutrients. The wider the roots, the higher the potential of roots to absorb nutrients and water from the soil (Putra et al., 2020). Thus, water spinach protected by sweet corn could absorb water and nutrients better than water spinach not protected by sweet corn as a windbreaker. The metabolic activity of plant cells will increase if the soil water content is available when needed (Edy et al., 2010). If water availability is high, the rate of photosynthesis will increase, leading to a greater transfer of photosynthesis products to the roots, which in turn enhances root growth. Conversely, water spinach roots without sweet corn as a windbreaker may be inhibited due to suffocating conditions, which reduce the rate of photosynthesis. As a result, the products of photosynthesis transferred to the roots are reduced, resulting in poor root growth (Parwata et al., 2014). Therefore, water spinach with sweet corn as a windbreaker could absorb water better to increase cell metabolic activity for better root growth.

The planting location of sweet corn plants as a windbreaker affected the surface area of water spinach's leaf on the 32nd day after planting (Table 2). The leaf surface area of water spinach increased if the plant was protected with sweet corn as the windbreaker. All windbreakers tended to have the same ability to increase the surface area of water spinach leaves. Since the wind generally came from the east during water spinach growth, sweet corn windbreaker on the "east" or "east and west" were the most effective planting location to block the wind coming from east. Consequently, the microweather of water spinach plot is modified, thereby increasing soil moister content to support water spinach growth. Plants with high soil moisture content leads to better photosynthesis process because water plays a significant role in the process. This results in high production of photosynthesis (dry matter) for better plant growth (Parwata et al., 2014). Other planting locations, such as on "south" and "south and north" could also protect water spinach plot from wind when it came from the southwest in the final growth phase of water spinach, so that the leaf surface area in both locations could increase. This result was in contrast to Astutik (2017), that the surface area of green bean leaves tended to decrease when the shelter surrounds green beans, which might be caused by the decreased ability of plants to absorb light, nutrients, and water due to the density of individual shelters.

The increase of water spinach's leaf surface area with sweet corn windbreakers might be due to better root growth (Table 2) because the root served as water and nutrient absorbers (Putra et al., 2020). High soil moisture indicates water availability for plants to ensure that water spinach plants fulfill their water needs. Plants absorb water when the groundwater potential is higher than the plant water

Table 2. The root length, root surface area, and leaf surface area of water spinach in various planting locations of sweet corn as windbreakers

Planting location of sweet corn plants	Root length (cm)		Root surface area (cm²)		Leaf surface area (cm²)	
	20 DAP	32 DAP	20 DAP	32 DAP	20 DAP	32 DAP
Without	72.66 a	420.53 b	24.15 a	210.83 b	58.80 a	165.94 b
East	78.02 a	644.55 a	29.10 a	257.12 a	61.77 a	227.44 a
East and west	78.27 a	649.96 a	30.96 a	245.66 ab	61.90 a	215.36 a
South	79.19 a	645.95 a	25.07 a	239.40 ab	60.46 a	208.16 a
South and north	72.86 a	587.34 ab	27.61 a	229.36 ab	58.15 a	208.96 a
Mean	75.45	590.25	27.38	236.47	60.22	205.17
CV (%)	11.28	15.85	13.47	7.19	6.55	13.94

Remarks: Numbers followed by the same letter in the column do not differ markedly in Tukey HSD α = 5%.

potential, so plants can absorb water more efficiently. Conversely, when the soil moisture content is low, the groundwater potential is lower than the plant water potential, making it difficult for plants to absorb water (Ipaulle et al., 2023). Thus, water spinach protected by sweet corn as a windbreaker, especially on the "east" and "east and west" can absorb water better than water spinach not protected by sweet corn. Plant growth and development require water for cell division and enlargement (Edy et al., 2010), so high soil moisture content can increase leaf growth. Low soil moisture content or drought inhibits meristem tissue by reducing division of cell, elongation of cell, and enlargement of cell, causing a decrease in plant growth (Hasanuzzaman et al., 2018).

The planting location of sweet corn windbreaker affected the dry weight of plants on the 32nd day after planting water spinach, either the dry weight of the roots, shoots, or even the whole plants (Table 3). Sweet corn windbreaker grown on the "east" and "east and west" could increase the dry weight of crop. Meanwhile, the application of windbreakers on the

Table 3. The dry weight of roots, shoots, and total water spinach in various planting locations of sweet corn as windbreakers

Planting location of sweet corn plants	Root dry weight (g)		Shoot dry weight (g)		Total dry weight (g)	
	20 DAP	32 DAP	20 DAP	32 DAP	20 DAP	32 DAP
Without	0.10 a	1.11 b	0.37 a	1.45 b	0.47 a	2.56 b
East	0.12 a	2.16 a	0.41 a	2.55 a	0.53 a	4.71 a
East and west	0.14 a	1.63 ab	0.41 a	2.00 ab	0.54 a	3.61 ab
South	0.13 a	1.46 b	0.39 a	1.81 b	0.52 a	3.27 b
South and north	0.10 a	1.53 b	0.37 a	1.72 b	0.47 a	3.25 b
Mean	0.12	1.58	0.39	1.90	0.51	3.48
CV (%)	15.95	17.51	15.38	15.58	7.24	15.71

Remarks: Numbers followed by the same letter in the column do not differ markedly in Tukey HSD α = 5%.

Table 4. The specific leaf weight, ratio of leaf area, net assimilation rate, and relative growth rate of water spinach in various planting locations of sweet corn as windbreakers

Planting location of sweet corn plants	Specific leaf weight (g.dm^{-2})		Leaf area ratio (dm^2.g^{-1})		Net assimilation rate (g.cm^{-1}.day^{-1})	Relative growth rate (g.day^{-1})
	20 DAP	32 DAP	20 DAP	32 DAP		
Without	1.28 a	0.66 a	0.36 a	0.44 a	1.69 b	0.14 b
East	1.21 a	0.50 a	0.35 a	0.55 a	2.79 a	0.18 a
East and west	1.18 a	0.62 a	0.36 a	0.46 a	2.12 ab	0.16 ab
South	1.18 a	0.63 a	0.35 a	0.44 a	1.91 b	0.15 b
South and north	1.26 a	0.64 a	0.35 a	0.41 a	1.98 ab	0.16 ab
Mean	1.22	0.61	0.35	0.46	2.10	0.16
CV (%)	6.55	13.94	5.98	14.50	18.01	7.35

Remarks: Numbers followed by the same letter in the column do not differ markedly in Tukey HSD α = 5%.

Table 5. Root shoot ratio, yield, and consumption index of water spinach in various planting locations of sweet corn as windbreakers

Planting location of sweet corn plants	Root shoot ratio		Dry harvest index	Yield (g.plant^{-1})	Fresh harvest index
	20 DAP	32 DAP			
Without	0.28 a	0.75 a	0.57 a	30.05 b	0.56 a
East	0.31 a	0.87 a	0.55 a	37.98 a	0.59 a
East and west	0.35 a	0.81 a	0.56 a	36.50 a	0.57 a
South	0.35 a	0.80 a	0.56 a	34.74 ab	0.57 a
South and north	0.29 a	0.89 a	0.53 a	33.27 ab	0.58 a
Mean	0.32	0.82	0.55	34.51	0.57
CV (%)	14.18	9.53	5.45	12.05	3.32

Remarks: Numbers followed by the same letter in the column do not differ markedly in Tukey HSD α = 5%.

"south" or "south and north" did not increase dry weight compared to without windbreakers. Sweet corn windbreakers planted on the "east" and "east and west" could increase dry weight of water spinach than those on "south" and "south and north". As the sweet corn windbreakers on the "east" and "east and west" could block the wind generally coming from the east, the microweather of water spinach plot is modified, including increased air humidity and soil moisture content, thus supporting the growth of water spinach. Higher soil moisture content makes it easy for plants to absorb water and nutrients to support plant growth. Soil moisture content shows that water availability during the growing period plays a crucial role in plant metabolic processes, leading to increased plant weight gain as the plants age (Edy et al., 2010).

Sweet corn windbreaker did not affect SLW and LAR of water spinach. There was an influence of the sweet corn planting location on the water spinach's NAR and RGR (Table 4). Sweet corn on the "east" increased the water spinach NAR. The same effect was seen in RGR water spinach protected by sweet corn on the "east". The increase in NAR dan RGR of water spinach protected by sweet corn windbreaker on the "east" might be caused by increasing soil moisture content due to the wind being blocked by sweet corn windbreaker planted on the "east" to decrease evaporation. Setyaningrum et al. (2018) stated that increase plant dry matter is the most used primary growth indicator, where dry matter is accumulated from photosynthesis, nutrient absorption, and water processed through biosynthetic processes that increase with plant age. Water spinach protected by sweet corn windbreaker on the "east" could easily absorb water and nutrients to support plant metabolic process, so the NAR and RGR increased.

Windbreakers using sweet corn throughout the location did not affect the RSR and dry harvest index of water spinach (Table 5). The yield of water spinach increased with windbreakers on the "east" as well as "east and west". Although water spinach yields increased by sweet corn windbreaker placed on the "east" and "east and west", the fresh harvest index, or consumable parts of the plant, like shoot part, did not increase. Although the sweet corn windbreaker on the "east" and "east and west" slowed down the wind speeds, modified microweather by increasing air humidity and soil moisture levels, and decreased air temperature, microweather modification was still not suitable for water spinach growth. The ideal air temperature for water spinach ranges from 25–30°C (Nugroho et al., 2022). Water spinach also grows well in air humidity of 60% (Fikri et al., 2015). This suboptimal microweather may cause the dry harvest index and fresh harvest index of water spinach to remain unchanged, despite being protected by windbreaker using sweet corn.

CONCLUSIONS

Sweet corn as a windbreaker positioned on the "east", perpendicular with wind direction, was the most effective planting location in reducing wind speed and modifying microweather in November on the Samas coastal sandy land. Sweet corn windbreaker on the "east" slowed down the wind speed which then increased air humidity and soil moisture content and decreased air temperature. Growth, dry weight accumulation, and water spinach yield increased with sweet corn windbreaker planted on the "east". Nevertheless, the dry harvest index and fresh harvest index of water spinach did not increase.

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