

Original Research Article

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Evaluating the Effect of Horse Pursulane (*Trianthema portulacastrum* L.) Competition on Maize (*Zea mays* L.)

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ABSTRACT

Trianthema portulacastrum L. (Family: Aizoaceae), commonly known as horse pursulane is a troublesome broadleaved weed in India. Aggressive growth of this type of weeds with high invasion potential it becomes an important constraint in crop cultivation. Yield losses are most severe when weeds and crops emerge simultaneously and compete with each other for resources. Crop yield usually decreases with increase in weed density and interference duration. The competition effect of Horse pursulane on growth and yield attributes of maize experiment was conducted during January 2018 at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai. Treatments like weed free check, horse pursulane densities (7, 14, 21, 28 and 35 m⁻²) and unweeded check were laid out in Randomized block design (RBD) with three replications. The results indicated that, higher weed density m⁻² reduce the growth parameters like LAI and dry matter production and yield attributes. Weed free check recorded higher grain yield of 8577 kg/ha. The yield loss (%) was higher (44.78%) in T₆ with 35 plants m⁻² than other weed density treatments. Horse pursulane infests maize heavily, causing enormous yield losses and threatens the sustainability of maize production.

Keywords

Trianthema portulacastrum,
Weed density, Yield loss

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Introduction

Maize (*Zea mays* L.) is one of the most important cereal crops grown all over the globe as poor man's food and also as cattle and poultry feed. It is a versatile crop, allowing it to grow across a wide range of agro ecological zones. Weeds are self-grown and appear simultaneously with crop plant creating severe competition for nutrient, moisture, space and solar energy resulting in

reduced crop yield (Umapathy and Sivakumar, 2000). Competition from weeds is most important of all biological factors that reduce agricultural crop yield. This occurs primarily because weeds utilize resources much faster than crops that create competition for resource consumption of crops. The magnitude of yield loss is affected by numerous agronomic and environmental factors, of which weed density and time of emergence relative to the crop causes major yield loss. The season-long weed

competition caused considerable yield losses in maize of about 35- 70% (Dalley *et al.*, 2006).

Trianthema portulacastrum is an indigenous plant to South Africa and occurs in India, Pakistan, Bangladesh, Srilanka, West Asia, Africa and Tropical America ((Balyan and Bhan (1986). In India, it is a very common weed of various farm crops, non-crop lands, grasslands and wastelands. It has been observed as a problematic weed in various agricultural crops in the states of Uttar Pradesh, Punjab, Haryana, Rajasthan and Delhi (Aneja *et al.*, 2000, Singh and Prasad, 1994). Horse purslane is a fast-growing, prostrate, profusely branched, succulent, rainy season, and annual broadleaf weed and reaches peak growth within 40-45 days of its emergence and maximum seedling emergence takes place during rainy season in cultivated and wastelands (Balyan and Malik (1989) and Singh and Prasad (1994)). Due to its indeterminate habit, vegetative and reproductive growth continues for the entire life span (Nayyar *et al.*, 2001). The hard seed coat appears to be the primary mechanism of horse purslane dormancy, thus making it a problem for several years and infesting the crops raised subsequently (Umarani and Selvaraj, 1995). Keeping this view the present study was undertaken to study the competition effect of *T. portulacastrum* on maize.

Materials and Methods

The field experiment was conducted at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu during January to April of 2018 to study the competition effect of *Trianthema portulacastrum* on maize. The treatments like weed free check, horse pursulane densities (7, 14, 21, 28 and 35 m⁻²) and unweeded check were laid out in Randomized block design (RBD) with three replications. The rotavator

was used to form ridges and furrows and the seeds of maize hybrid CO MH 6 were sown on the sides of the ridges by adopting a spacing of 60 x 25 cm. *Trianthema portulacastrum* densities were maintained as per the treatments and all other weeds are removed manually throughout the growing season.

During the course of study data were recorded on dry matter production and LAI of maize at 30, 45 and 60 DAS, and yield attributes, grain yield and yield loss in maize due to *T. portulacastrum* were also examined. The data were analyzed using ANOVA and the least significant difference (LSD) values at 5% level of significance were calculated.

Results and Discussion

Significantly higher dry matter production was recorded in less crop weed competition plots than higher weed density plots comparatively. Dry matter production recorded in weed free check at 30, 45 and 60 DAS accounts 1683, 4620 and 6513 kg/ha respectively. This is because both the weed species and the crop compete simultaneously for nutrients and moisture. The weed produces higher biomass than crop in its growth period (Jeschke *et al.*, 2009). A reduction in the dry weight of individual plants, probably related to both intraspecific and interspecific competition at higher densities. The results were comparable with the findings of Das (2008).

The leaf area index was significantly higher (1.01) in Weed free check (T₁) than other treatments at 30 DAS. Weed free check (T₁) recorded perceptibly higher leaf area index of 4.59 and 5.65 at 45 and 60 DAS respectively and was comparable with *Trianthema portulacastrum* of 7 plants/m² (T₂). Irrespective of the stages of observation, besides unweeded check, LAI was discernibly low in *Trianthema portulacastrum* of 35

plants/m² (T₆) among the treatments imposed. A similar effect that was related to a higher density caused a higher reduction in the leaf area (Hazra *et al.*, 2011) (Table 1).

The perusal of data revealed that grain yield of maize was significantly influenced by *T. portulacastrum* densities (Table 2). Weed free check (T₁) and *Trianthema portulacastrum* of 7 plants/m² (T₂) recorded the maximum grain yield of 8577 and 8125 kg ha⁻¹, respectively. Drastically lower grain yield of 4737 kg/ha

was obtained from *Trianthema portulacastrum* of 35 plants/m² (T₆) and was at par with unweeded check (T₇). The decreasing in yield with increasing weed density was likely due to interspecific competition for resources (Baye and Bouhache, 2007) (Fig. 1).

Mundra *et al.*, (2003) reported that reduction in crop-weed competition recorded significant increase in the dry matter accumulation and yield attributes which led to significantly higher grain yield.

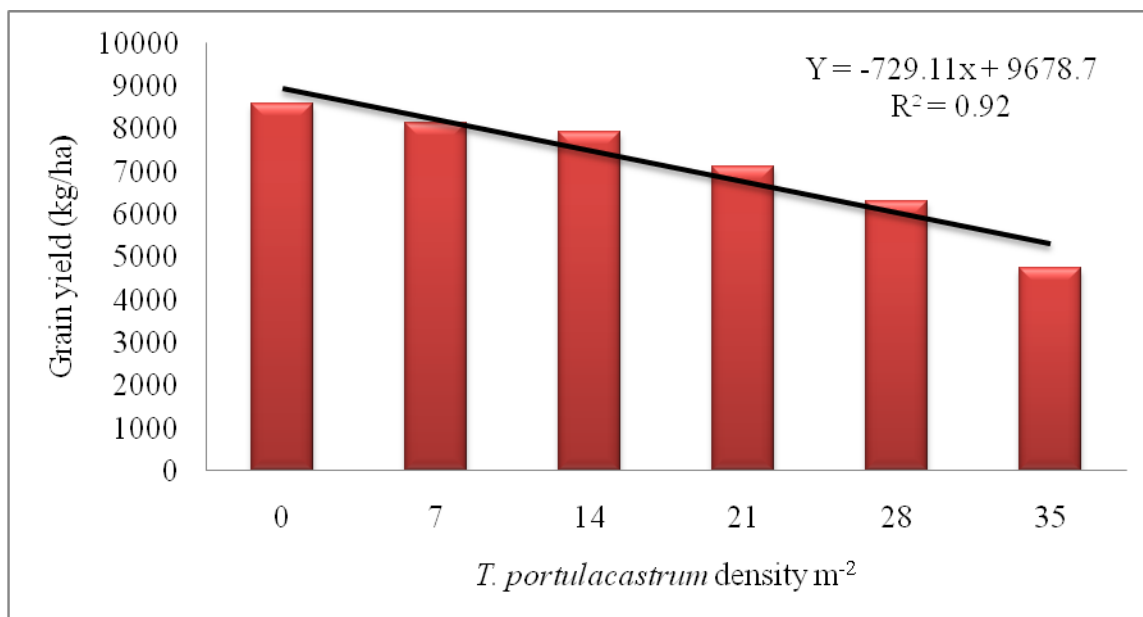
Table.1 Effect of *Trianthema portulacastrum* density on leaf area index and dry matter production (kg/ha) on maize

Treatments	Leaf Area Index			Dry matter production (kg/ha)		
	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS
T ₁ - Weed free check	1.01	4.59	5.65	1683	4620	6513
T ₂ - <i>T.portulacastrum</i> of 7 plants/m ²	0.76	3.72	5.30	1329	4285	6320
T ₃ - <i>T.portulacastrum</i> of 14 plants/m ²	0.52	3.60	4.80	1263	3373	6073
T ₄ - <i>T.portulacastrum</i> of 21 plants/m ²	0.30	3.11	4.50	929	2665	4920
T ₅ - <i>T.portulacastrum</i> of 24 plants/m ²	0.27	2.95	4.15	847	2532	4580
T ₆ - <i>T.portulacastrum</i> of 35 plants/m ²	0.23	2.40	3.50	622	1861	3367
T ₇ - Unweeded check	0.12	2.27	2.97	567	1697	3133
SEd	0.04	0.13	0.17	57.16	202.40	213.11
CD (P=0.05%)	0.09	0.27	0.36	124.53	441.00	464.34

Table.2 Effect of *Trianthema portulacastrum* density on single cob weight (g), grain yield (kg/ha) and yield loss % on maize

Treatments	Single cob weight (g)	Grain yield (kg/ha)	Yield loss (%)
T ₁ - Weed free check	183.8	8577	-
T ₂ - <i>T.portulacastrum</i> of 7 plants/m ²	174.1	8125	5.28
T ₃ - <i>T.portulacastrum</i> of 14 plants/m ²	169.8	7924	7.62
T ₄ - <i>T.portulacastrum</i> of 21 plants/m ²	152.3	7107	17.14
T ₅ - <i>T.portulacastrum</i> of 24 plants/m ²	134.8	6291	26.66
T ₆ - <i>T.portulacastrum</i> of 35 plants/m ²	101.5	4737	44.78
T ₇ - Unweeded check	95.9	4475	47.82
SEd	9.15	297	-
CD (P=0.05%)	19.93	647	-

Fig.1 Interaction effect of *T. portulacastrum* density m⁻² on Grain yield (kg/ha) of Maize



Higher yield loss of 44.78% was recorded in plot having higher weed *Trianthema portulacastrum* density of 35 plants m⁻² compared to plots have lower weed density of 7 plants m⁻² (5.28 % of yield loss). The decreasing trend in yield due to weed density showed that *T. portulacastrum* affected grain yield with higher yield loss % reported by (saeed *et al.*, 2010).

It can be concluded that all the *T. portulacastrum* densities were equally competitive to Maize and effectively reducing the yield. Higher grain yield was obtained from *T. portulacastrum* 7 plants m⁻² than other weed density treatments, leading to significant reductions in the growth, nutrient uptake, and yield.

However, the actual period before the weeds begin to affect the crop appears to be related to the time taken by *T. portulacastrum* to achieve complete ground cover. For obtaining higher yield of maize the broad leaved weeds may be controlled upto 3 weeks after emergence of the crop as it is found to be the critical period of weed competition for maize.

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