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# Comparison Of Weed Management Systems And Their Profitability In Maize Production In The Rainforest Zone, Nigeria

**BY**

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## *ABSTRACT*

*Field experiments were conducted at the Teaching and Research Farm of Akwa Ibom State College of Education, Afaha Nsit, Nigeria to investigate different weed management systems and their profitability in maize production. The experiment was raised in randomized complete block design with three replicates. Nine treatments comprising 1.5 kg ai/ha of atrazine + metolachlor (primextra) integrated with vegetable cowpea 'akidi' Vigna unguiculata sub spp sesquipedalis densities (40,000, 50,000, 60,000 and 70,000 plants/ha) while primextra (3.0 kg ai/ha), melon density (20,000 plants/ha), hand-weeded twice and unweeded served as controls. Data on weed characteristics, maize growth and grain yield were analysed using analysis of variance. The treatment plots of primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants/ha) produced the significantly lower weed density and biomass, higher average grain yield of 4.10 t/ha and economic net benefit of ₦128,330 th an the values obtained from the commonly used weed management systems in the study area. Therefore, it is recommended in the rainforest zone, Nigeria.*

## INTRODUCTION

The food products of maize are popularly acceptable across Nigeria than sorghum and millet products (John and Akpan, 1997). However, the maize grain yield of 1.7 t/ha in Nigeria is against 7.0 t/ha obtained in United States of America (Onwuene and Sinha, 1997). The relatively low yield could be attributed to soil fertility and weed competition among other factors. Striga weed competition reduced maize grain yield by 65-92% in savannah zone, Nigeria (IITA, 2000). Generally maize grain yield losses due to weeds competition ranged from 40-60% in the tropics (Akobundu, 1987).

At present two hand-weedings for weed control are recommended in maize production in Nigeria (Umanah, 2005). While the recommended optimum density of

egusi-melon (*Colocynthis citrullus*) for weed control is 20,000 plants/ha (Obiefuna, 1989 and Enyinnia *et al.*, 1994). However, this weed option requires supplementary hand-weeding at the initial establishment of the cover crop. Hand-weeding is costly, unreliable and cumbersome. While high use of herbicide (primextra 3.0 kg ai/ha and atrazine 3.0 kg ai/ha) recommended by Chinaka and Enyinnia (1982) and Akinyemi (1988) respectively in maize production in the rainforest zone, Nigeria could be injurious to the environment (Buhler, 2002).

Currently, many published works with herbicide versus hand-weeding and little work on integrated weed management under farmers production conditions are available in the tropic (Buhler 2002). Furthermore, legumes are commonly intercrop ped witharable crops in northern Nigeria but not commonly intercropped in the rainforest zone, Nigeria (Njoku and Muoneke, 2008); perhaps cowpea is readily attacked by pests and diseases in this agro-ecology. However, vegetable cowpea (akidi) is adapted to the humid rainforest and Okpara (2000) reported maize grain yield advantage of maize intercropped with vegetable cowpea in Eastern Nigeria. Besides, legumes are generally beneficial to crop in association (Solubu, 2000).

It is in the light of the above, that the investigation on integration of primextra with vegetable cowpea for weed control in maize was undertaken to compare the weed control effectiveness, maize performance and the economic returns with the recommended weed management options in the study area.

**Materials and Methods:**

Field experiment was conducted at the teaching and Research farm of the College of Education, Afaha Nsit (Latitude $4^0$ 50' N and Longitude $7^0$ 16'E), Akwa Ibom State, Nigeria, during 2009 early and 2nd planting seasons.' The experimental site was cleared and tilled manually and the experiment was raised in randomized complete block design with three replicates. Each plot measured 6 x 4 m and spaced 1.5 m. Nine treatments comprising of primextra (1.5 kg ai/ha) integrated with akidi 40,000, 50,000, 60,000, 70,000 plants/ha) while primextra (3.0 kg ai/ha), melon (20,000 plants/ha), hand-weeded twice and unweeded served as controls.

Maize variety (TZESR) was planted 75x25 cm (53,333 plants/ha) on $10^{th}$ March and $10^{th}$ August, 2009. Vegetable cowpea was planted 1x1m and thinned to maintain the density according to the treatments. Melon was sown 4/hole and thinned to 2/stand (20,000 plants/ha). Primextra was applied pre-emergence. The plot of melon

was weeded once at 3 weeks after sowing (WAS). The herbicide treated plots were not weeded hand-weeded treatment plots were weeded twice at 3 and 6 WAS.

Weed density ($m^{-2}$) and biomass (kg/ha) were taken at 3, 5, and 7 WAS. Maize plant height, number of leaves/plant, leaf area index were taken for nightly. Maize yield components and grain yield were taken at harvest 120 days after planting. Analysis of variance was used to analyze the data. Treatment means were separated using Duncan's Multiple Range Test.

## RESULTS

Weed densities of 188.72, 200.01 and 198.95$^{m-2}$ obtained from the plots of melon (20,000 plants/ha) plus supplementary hand-weeding once, hand-weeded twice and unweeded were significantly ($P<0.05$) higher than the weed densities obtained from the plots of primextra (3.0 kg ai/ha), primextra (1.5 kg ai/ha) integrated with akidi at 3 WAP. The significantly ($P< 0.05$) lowest weed density of 4.82$m^{-2}$ was obtained from the plot of primextra (3.0 kg ai/ha) at 5 WAP. However at 7 WAP, the plots of primextra (1.5 kg ai/ha) integrated with akidi (60,000 and 70,000 plants/ha) and the plot of melon density (20,000 plants/ha) plus one supplementary hand-weeding once produced the weed density, which were significantly ($P<0.05$) lower than the densities obtained from other treatment plots. Similar trend was observed in the 2$^{nd}$ planting season. The weed biomass followed the same trend with the weed density with the significantly ($p<0.05$) lowest biomass of 26.87 kg/ha obtained from the plot of primextra (3.0 kg ai/ha) at 5 WAP in early planting seasons.

The significantly ($P<0.05$) lowest plant height of 22.0 1 cm and 71.63 was obtained from the plots of primextra (3.0 ke ai/ha) at 3 and 5 WAP respectively in the early planting season. However; at 7 WAP, the significantly lowest plant height of 132.03 cm was obtained from the unweeded followed by 138.15 cm obtained from the plot of primextra (3.0 kg ai/ha). Similar trend was observed in the late planting season. Number of leaves/plant followed the trend of the plant height in both planting seasons. The significantly leaf area index of 0.41 and 0.38 was obtained from the plot treated with primextra (3.0 kg ai/ha) in early and 2$^{nd}$ planting seasons respectively at 3 WAP. The leaf area index obtained from the plots treated with primextra (1.5 kg ai/ha) and integrated with akidi and also the plot of melon (20,000 plants/ha) plus one supplementary hand-weeding once were not found to differ significantly in both planting seasons.

The lowest cob length (cm), number of rows/ear, number of grains/cob and average grain yield of 16.03 cm, 16.72 cm, 391.21 and 3.55 t/ha were obtained from the plot of primextra (3.0 kg ai/ha) respectively in the early planting season similar

tend was obtained in the 2nd planteing season.These yield components and yield were significantly ($p<0.05$) higher than the values obtained from the unweeded plots but lower than the yield components and grain yield obtained from the plots treated with primextra (1.5 kg ai/ha) and integrated with akidi densities (40,000, 50,000, 60,000 and 70,000 plants/ha). The highest grain yield of 4.10 t/ha was obtained from the plot of primextra (1.5 kg ai/ha) plus akidi (70,000 plants/ha).

However, this average value (4.10 t/ha) was not found to differ significantly from the average grain yield of 4.05, 4.08 and 4.06 t/ha obtained from the plots of primextra (1.5 kg ai/ha) plus akidi 50,000, and 60,000 plants/ha and also the plot of melon density (20,000 plants/ha) plus supplementary hand-weeding once respectively.

The highest total net benefit of N128, 330 was obtained from the plots of primextra (1.5 kg ai/ha) plus akidi (70,000 plots/ha), followed by N126, 880 obtained from the treatment plot of primextra (1.5 kg ai/ha) plus akidi 60,000 plants/ha). The plots of melon density (20,000 plants/ha), primextra (3.0 kg ai/ha) and hand-weeded twice produced the net-benefits of N119, 990, N69, 000 and N79, 630 respectively.

## DISCUSSION

The lowest weed density and biomass obtained from the plot treated with primextra (3.0 kg ai/ha) at 3 WAP could be attributed to the 50% increase in the rate of the primextra compared to 1.5 kg ai/ha. Similar high rate of primextra was found to give more effective weed control compared with the lower rate in a millet-cowpea intercrop (Joshua and Gworgwor 2001). However, at 7 WAP the high dose of primextra (3.0 kg ai/ha) probably lost its potency resulting in higher weed density of 21.8% compared with the weed density obtained from the plots of primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants/ha). The result is in agreement with the report by Njalayo and Sibuga (1977) and Chikoye *et al*, (2000) that integration of herbicide with cover crops controlled weeds better than only herbicide or cover crops.

Plant height, number of leaves/plant and leaf area index obtained from the plot of primextra (3.0 kg ai/ha) were reduced by 10.1, 15.0 and 9.1% respectively compared with the values obtained from the plot of primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants /ha). The full dose of primextra (3.0 kg ai/ha) might produce temporary phytotoxic effects on maize. Generally, one of the effects of the high rate of herbicide includes crop injury particularly at the early development of the crop (FAO, 2004). Similarly, Hudu (1990) reported temporary toxicity of atrazine applied at 2.0 kg ai/ha on cassava than the lower rate.

The average grain yield of 4.10 t/ha obtained from the plot of primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants/ha) was higher by 9.0% compared with the grain yield obtained from the treatment plot (primextra 3.0 kg ai/ha). This could be partly related to the phytotoxicity effects on the early development of the crop and the high weed density and biomass incurred in this plot at 7 WAP leading to the significant reduction in the yield components (cob length, cob diameter, number of rows/ear and number of grains/cob). This finding is in line with the report by Buhler (2002) that advantages of integrated weed management include satisfactorily weed control and sustainable crop yield enhancement than the use of only one weed control option.

The highest average variable cost of N154,370 was incurred with hand-weeded twice probably, due to the intensive labour and high cost as observed by Wicks *et al.* (1995); and this weed control option has tremendously reduced in advanced agriculture (Lavabre, 1991). Hence prospects for improved weed management should include innovations that will make weeding attractive, profitable and sustainable (Buhler, 2002).

The plot treated with primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants/ha) produced the average net benefits of 46.2, 38.0 and 6.5% higher than the net benefits obtained from the commonly used weed management options (primextra at 3.0 kg ai/ha, hand-weeded twice and melon (20,000 plants/ha) and supplemented with one-hand weeding in the study area. This observation could be traced to the fact that this integrated weed management plots produced the highest maize grain and akidi seed yields. Similar report by Njoku and Muoneke (2008) revealed that the highest seed yield of cowpea (Vigna unguiculata) was obtained from the plot with the highest cowpea density of 80,000 plants/ha. Furthermore, the relatively high akidi seed yield served as additional income and hand-weeding which is costly was completely eliminated in herbicide-akidi treatments. Teadale (1988) maintains that the goal of integrated weed management is designed to optimize benefits and minimize liabilities associated with other weed control options.

Conclusively Primextra (1.5 kg ai/ha) integrated with akidi (70,000 plants/ha) controlled weeds satisfactorily, enhancing the growth and grain yield of maize and increased the net benefit higher than the commonly used weed management options adopted in maize production in the study area. It is therefore recommended in the rainforest zone, Nigeria.

**Table I: Effects of weed management options on weed density in maize field (early March) and 2 nd (August) Planting seasons, 2009**

| Treatments | Weed Density/M2 | | | | | |
|---|---|---|---|---|---|---|
| | Early planting, 2009 | | | 2nd Planting, 2009 | | |
| | - 3 WAP | - 5 WAP | - 7 WAP | - 3 WAP | - 5 WAP | - 7 WAP |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 7.03b | 16.60b | 19.98b | 6.91b | 12.01b | 14.13b |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 7.11b | 10.07bc | 13.79bc | 7.01b | 6.00bc | 11.01bc |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 5.80b | 8.31 bc | 10.00c | 6.81b | 5.71 bc | 7.65c |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 5.92b | 7.88 bc | 9.95 c | 5.60 b | 5.07 bc | 7.10c |
| Melon (20,000 plants/ha) + Hand weeding once | 188.72a | 9.72 bc | 11.10 c | 184.79 a | 6.00 bc | 8.98 c |
| Primextra (3.0 kg ai/ha) control | 4.00 c | 4.82 c | 19.76 b | 3.02 c | 3.93c | 14.08 b |
| Hand weeded (twice) control | 200.01a | 15.00 b | 20.10b | 191.93 a | 11.98b | 13.97 b |
| Unweeded (control) | 198.95a | 266.35 a | 255.81a | 187.65 a | 215.76a | 209.13 a |

Means followed by the same letters in a column is not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 2: Effect of weed management o ptions on weed biomass in maize field (early March) and 2 nd (August) Planting seasons, 2009**

| | Weed Biomass | | | | | |
|---|---|---|---|---|---|---|
| | Early planting, 2009 | | | 2nd Planting, 2009 | | |
| | - WAP - | | | - WAP - | | |
| | 3 | 5 | 7 | 3 | 5 | 7 |
| **Treatments** | | | | | | |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 27.02 b | 47.51b | 51.02b | 25.07b | 43.71b | 48.92b |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 27.00 b | 33.03bc | 44.87bc | 25.03b | 30.04bc | 39.83 bc |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 26.95 b | 31.74 bc | 40.98 c | 24.88 b | 29.79 bc | 35.03 c |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 26.89 b | 32.35 bc | 39 .10c | 524.60 b | 29.43bc | 34.93 c |
| Melon (20,000 plants/ha) + Hand weeding once | 396.00a | 31.61 c | 41.68 c | 298.35 a | 29.00bc | 34.41c |
| Primextra (3.0 kg ai/ha) control | 18.35 c | 26.87 c | 50.00 b | 15.17 c | 22.32c | 48.89 b |
| Hand weeded (twice) control | 398.98a | 48.06b | 49.88b | 300.67a | 44.01 b | 50.00 b |
| Unweeded (control) | 481.12a | 647.95a | 701.72a | 393.21a | 549.34a | 493.46a |

Means followed by the same letters in a column is not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 3: Effect of weed management options on maize height (cm) in (early March) and 2nd (August) Planting seasons, 2009**

| | Weed Density/M$^2$ | | | | | |
|---|---|---|---|---|---|---|
| | Early planting, 2009 | | | 2nd Planting, 2009 | | |
| | WAP | | | WAP | | |
| Treatments | 3 | 5 | 7 | 3 | 5 | 7 |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 24.28a | 79.92a | 140.91ab | 22.97a | 69.95a | 138.92ab |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 24.96a | 80.03a | 141.52ab | 32.03a | 71.91a | 139.01ab |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 25.09a | 80.51a | 144.88a | 23.17a | 72.50a | 140.95a |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 25.10a | 80.75 a | 144.92a | 23.48a | 72.94a | 141.00a |
| Melon (20,000 plants/ha) + Hand weeding once | 25.13a | 379.90a | 144.00a | 23.60a | 69.95a | 140.89a |
| Primextra (3.0 kg ai/ha) control | 22.01b | 72.63b | 138.15b | 19.64b | 63.70b | 135.67b |
| Hand weeded (twice) control | 25.31a | 79.98a | 141.98a | 22.87a | 72.13a | 140.90a |
| Unweeded (control) | 25.00a | 74.59ab | 132.03c | 22.91a | 63.68b | 131.61c |

Means followed by the same letters in a column is not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 4: Effects of weed management options on number of leaves/maize plant in (early March) and 2nd (August) Planting seasons, 2009**

| Treatments | Early planting, 2009 | | | WAP | 2nd Planting, 2009 | | |
|---|---|---|---|---|---|---|---|
| | 3 | 5 | 7 | | 3 | 5 | 7 |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 6.76a | 10.00a | 12.91a | | 5.891a | 8.95a | 11.83a |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 6.90a | 10.10a | 13.00a | | 5.89a | 9.04a | 11.90a |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 6.95a | 10.13a | 13.03a | | 5.90a | 8.98a | 11.87a |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 7.00a | 10.00a | 13.12a | | 5.88a | 8.90a | 11.98a |
| Melon (20,000 plants/ha) + Hand weeding once | 6.93a | 10.21a | 13.07a | | 6.13a | 9.08a | 12.01a |
| Primextra (3.0 kg ai/ha) control | 4..33b | 8.67b | 12.92a | | 4.10b | 7.27b | 11.92a |
| Hand weeded (twice) control | 6.89a | 10.99a | 12.96a | | 5.09a | 9.03a | 12.00a |
| Unweeded (control) | 7.00a | 8.87b | 10.96b | | 5.88a | 7.09b | 10.09b |

Means followed by the same letters in a column is not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 5: Effects of weed management options on number of leaves/maize plant in (early March) and 2 nd (August) Planting seasons, 2009**

| Treatments | Early planting, 2009 | | | WAP | 2nd Planting, 2009 | | |
|---|---|---|---|---|---|---|---|
| | 3 | 5 | 7 | | 3 | 5 | 7 |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 0.58a | 1.19a | 1.98a | | 0.55a | 1.16a | 1.88a |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 0.58a | 1.22a | 2.00a | | 0.57a | 1.18a | 1.90a |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 0.60a | 1.22a | 2.10a | | 0.59a | 1.19a | 1.91a |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 0.60a | 1.21a | 2.10a | | 0.58a | 1.19a | 1.89a |
| Melon (20,000 plants/ha) + Hand weeding once | 0.57a | 1.20a | 1.95a | | 0.55a | 1.17a | 1.92a |
| Primextra (3.0 kg ai/ha) control | 0.41b | 1.10ab | 1.78ab | | 0.38b | 1.08ab | 1.63ab |
| Hand weeded (twice) control | 0.60a | 1.20a | 1.97a | | 0.58a | 1.18a | 1.91a |
| Unweeded (control) | 0.58a | 1.03b | 1.63b | | 0.55a | 1.01b | 1.42 b |

Means followed by the same letters in a column is not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 6:** **Effects of weed management options on maize yield components and grain yield (t/ha) in early March) a nd 2nd (August) Planting seasons, 2009**

| | Early planting season, 2009 | | | | | 2nd Planting season, 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Treatments | Cob Length (cm) | Cob diameter (cm) | No. of rows/ ear | No. of Grains /cob | Grain yield (t/ha) | Cob length (cm) | Cob diameter (cm) | No. of rows/ ear | No. of grains /cob | Grain yield (t/ha) |
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 17.88a | 6.95a | 17.04ab | 388.11ab | 4.08ab | 16.24ab | 5.81ab | 16.05ab | 379.81ab | 3.73ab |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 18.96a | 7.00a | 19.10a | 406.72a | 4.24a | 16.98ab | 5.90a | 17.19a | 396.77a | 3.85a |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 18.98a | 7.03a | 19.12a | 409.00a | 4.78a | 17.02a | 5.96a | 17.23a | 398.90a | 3.88a |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 19.00a | 7.05a | 19.08a | 410.07a | 4.30a | 17.02a | 6.00a | 17.18a | 400.00a | 3.92a |
| Melon (20,000 plants/ha) + Hand weeding once | 18.78a | 6.97a | 18.89a | 398.95a | 4.25a | 17.00a | 5.85a | 17.25a | 391.96a | 3.85a |
| Primextra (3.0 kg ai/ha) control | 16.03b | 6.56ab | 16.72b | 391.21b | 3.90b | 15.51b | 5.08ab | 15.42b | 360.33b | 3.20b |
| Hand weeded (twice) control | 17.91ab | 6.98a | 17.09ab | 391.01ab | 4.1ab | 16.22ab | 6.00a | 16.08ab | 380.51ab | 3.70ab |
| Unweeded (control) | 9.50c | 5.35c | 10.92 c | 110.23c | 1.02c | 8.82c | 4.95b | 9.85c | 103.00c | 0.95c |

Means followed by the same letters in a column are not significantly different at $p<0.05$ (DMRT)

(DMRT)

**Table 7: Average Economic returns in maize production based on different weed management options in (early March) and 2nd (August) Planting seasons, 2009**

| Treatments | Average maize yield (t/ha) | Average akidi grain yield (t/ha) And melon Grain yield (kg/ha) | Average total variable cost/ha (N'000) | Average gross returns /ha (N'000) ( maize 1 kg = N60) | The average gross returns /ha (N'000) Akidi grain 1 kg = 100 & melon seed (1 kg =N75) | Total net gross returns /ha (N'000) maize grain yield and cover crop seeds | Average net benefit/ha (N'000) | Marginal rate of returns |
|---|---|---|---|---|---|---|---|---|
| Primextra (1.5 kg ai/ha) + Akidi (40,000 plants/ha) | 3.91 | 260.81 | 148.17 | 234.60 | 26.08 | 260.68 | 112.51 | 0.76 |
| Primextra (1.5 kg ai/ha) + Akidi (50,000 plants/ha) | 4.05 | 291.52 | 148.20 | 243.00 | 29.15 | 272.15 | 123.95 | 0.84 |
| Primextra (1.5 kg ai/ha) + Akidi (60,000 plants/ha) | 4.08 | 303.06 | 148.23 | 244.80 | 30.31 | 275.11 | 126.88 | 0.86 |
| Primextra (1.5 kg ai/ha) + Akidi (70,000 plants/ha) | 4.10 | 305.80 | 148.25 | 246.00 | 30.58 | 276.58 | 128.33 | 0.87 |
| Melon (20,000 plants/ha) + Hand weeding once | 4.06 | 339.67 | 149.09 | 243.60 | 25.48 | 269.08 | 119.99 | 0.80 |
| Primextra (3.0 kg ai/ha) control | 3.55 | - | 144.00 | 213.0 | - | 213.00 | 69.00 | 0.84 |
| Hand weeded (twice) control | 3.90 | - | 154.37 | 234.0 | - | 234.00 | 79.63 | 0.52 |
| Unweeded (control) | 0.97 | - | 85.71 | 58.20 | - | 58.20 | 27.51 | 0.32 |

Means followed by the same letters in a column are not significantly different at $p<0.05$ (DMRT)

(DMRT)

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