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Abstract: Insect pests in melon are complex to control and pesticides are used irrationally. The objective was to develop a chemical strategy for the control of insect pests in melon (Cucumis melo L.) under greenhouse. An experimental plot was implemented in a greenhouse in the community of Puerto La Boca, Ecuador, in the agricultural period 2019, where four treatments were evaluated: (1) Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application), (2) Systemic insecticide [(Thiamethoxan+lamda cyhalothrin) 0,25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application), (3) Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application) and (4) Control (water). These treatments were distributed in a completely randomized block experimental design with four replications. Each experimental unit consisted of three rows with 123 plants. The response variables were plant height, stem diameter, number of nodes, number of total flowers, number of fertilized flowers, number of fruits, fruit volume, fruit weight. The number of insects in the traps before and after the treatment was also evaluated and a cost analysis was made for each treatment. The results showed that the best control was with treatment T2 [systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + contact insecticide imidacloprid 0.60 g/L (alternate application)], obtaining an average fruit weight of 0.97 kg, with respect to the control which was 0.58 kg. With this treatment, a profitability of $2.10 was obtained for the supermarket and 46 cents for the local market.

Keywords: transplanting, flowering, fruiting, stages, physiology.

Resumen: Los insectos plaga en melón son complejos de controlar y se usa irracionalmente los plaguicidas. El objetivo fue Desarrollar una estrategia química para el control de los insectos plaga en el melón (Cucumis melo L.) bajo invernadero. Se implementó una parcela experimental en un invernadero en la comunidad de Puerto La Boca, Ecuador, en el periodo agrícola 2019, donde se evaluaron cuatro tratamientos: (1) Insecticida sistémico (Thiamethoxan+lamda cihalotrina) 0,25 mL/L + Insecticida de contacto (Avemectina) 2,25 mL/L (aplicación alternada), (2) Insecticida sistémico [(Thiamethoxan+lamda cihalotrina) 0,25 mL/L + Insecticida de contacto (Confidor) 0,60 g/L (aplicación alternada), (3) Insecticida sistémico (Thiamethoxan+lamda cihalotrina) 0,25 mL/L + Neen (orgánico) 4 mL/L (aplicación alternada) y (4) Testigo (agua). Estos tratamientos fueron distribuidos en un diseño experimental de bloques completamente al azar con cuatro repeticiones. Cada unidad experimental estuvo constituida por tres hileras con 123 plantas. Las variables de respuestas fueron altura de planta, diámetro de tallo, número de nudos, número de flores totales, número de flores fecundadas, número de frutos, volumen del fruto, peso del fruto. Asimismo, se evaluó el número de insectos en las trampas antes y después del tratamiento y se hizo un análisis de costos de cada tratamiento. Los resultados mostraron que el mejor control fue con tratamiento T2 [Insecticida sistémico (Thiamethoxan+lamda cihalotrina) 0,25 mL/L + Insecticida de contacto imidacloprid 0,60 g/L (aplicación alternada)], obteniéndose un peso promedio de fruto de 0,97 kg, respecto del testigo que fue de 0,58 kg. Con este tratamiento se obtuvo una rentabilidad de $2,10 para supermercado y 46 centavos de dólar para mercado de abasto local.

Palabras clave: Transplante, floración, fructificación, estadios, fisiología.

Introduction

World melon production reached approximately 29 626.34 million kg, covering an area of 1.19 million hectares. China, with a 49.8% share, leads world production with 14 752.9 million kg, followed by Turkey with 1 707.3 million (5.76%) and Iran with 1 476.8 million kg (4.98%) (Naranjo, 2018). In the Americas, the main melon producers and exporters are located in Brazil, Mexico, Costa Rica, Honduras, Dominican Republic, Ecuador, Venezuela, Guatemala; France, Romania and Italy in Europe (Chavez, 2018).

In Ecuador, melon is one of the main horticultural species grown in the agricultural soils of the province of Manabí, where it is planted in the dry and rainy seasons. The cultivated area in this province covers 663 hectares, generating an annual production of 7421 tons (Chávez, 2018). However, it is estimated an approximately 88% of fruit losses due to the effect of pest and disease attacks, which cause deformations, spots, cracks and small size (Espinoza-Arellano et al., 2023). According to Martínez (2020), the most important insect pests in the melon crop are

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the silverleaf whitefly *(Bemisia argentifolii*), the melon aphid *(Aphis gossypii*), the leaf miner (*Liriomyza sativae* and *Liriomyza trifolii*) and the melon borer (*Diaphania hyalinata*).

It is known that the coastal region of Puerto Cayo, in the community of Puerto La Boca, canton Jipijapa in Ecuador, is an intensive horticultural area, where melon, watermelon, tomato, bell pepper, cucumber, achocha, and some species of fruit trees, such as mangos, citrus, papaya, among others, are grown. In the area, melon is one of the crops with great economic importance, which is mainly destined for differentiated markets (supermarkets) and local consumption (Gabriel, 2021). Melon cultivation in this area is carried out under greenhouse and field conditions, which requires the necessary labor for cultural and post-harvest work.

The melon crop has been commercially exploited in the last decade, a period in which technologies were innovated, which contributed to being at the forefront of farming systems in the area (Gabriel et al., 2020 a, b). Traditional insect-pest management was based on the use of chemical pesticides, mainly from the organochlorine, organophosphate, carbamate, pyrethroid, neonicotinoid and other groups (Gabriel et al., 2023), for the control of adult and nymph stages of sucking insects such as whiteflies, aphids, bold and thrips; as well as larval stages of leafminers and lepidopterans, which have the greatest economic importance in the melon crop in this agricultural region (Gabriel et al., 2023). However, the applications made for the control of insect pests are not planned and do not follow a strategy.

The indiscriminate use of pesticides caused an imbalance in the balance between pest-insect populations and populations of beneficial organisms. As a result, pests increased to unimaginable levels and resistant insect populations were selected, causing greater dependence on chemical pesticides at increasingly higher doses. In addition, production costs increase, crop productivity is reduced, profitability for the producer is reduced, and environmental contamination and risk to human health increase (Gabriel et al., 2023).

It is worth mentioning that in the early days of melon farming in Puerto La Boca, the main pests were coccinellids, aphids and fruit-boring worms (Gabriel, 2021). The indiscriminate use of agrochemicals caused coccinellids (Coleoptera: Coccinellidae) and aphids (*Aphis gossipii* and *Myzus persicae*) decreased in abundance in the crop and fruit boring larvae species (*Diaphania* spp), became more economically important and caused an inordinate increase in the populations of boll weevil (*Prodiplosis logifilia*)) (Institute for Technological Innovation in

Agriculture [INTAGRI], 2020; Gabriel et al., 2023), and whitefly (*Bemisia* sp.) (Valarezo et al., 2008), which after being insects without economic importance, emerged as very important pests, not only for tomato, but also for melon and all vegetables grown in the region (Gabriel, 2021). The whitefly, in addition to sucking plant sap, is an efficient vector of viruses, causing important losses by reducing yields and fruit quality (Valarezo et al., 2008).

In Puerto La Boca, there is potential for the use of biological agents for the control of the main pests of economic importance, which can consist of the use of predators, parasitoids and entomopathogens (Gabriel et al. 2023). There is a natural beneficial fauna that can be efficiently exploited, which can be reinforced with the introduction and release of other beneficial insect species, which can be integrated into pest management. In addition, the action of entomopathogenic microorganisms can be involved, which can regulate the populations of pest insects causing diseases in individuals, and can induce the formation of epizootics in the region (Okrikata et al., 2022).

The preceding paragraphs show the importance of insect pests in the production of vegetables in general and melon in particular, so the objective of this research was to develop a chemical strategy for the control of insect pests in melon (Cucumis *melo* L.) cultivation under greenhouse conditions.

Methodology

Location

The research was developed in the period 2019 in a greenhouse of the Asociación Agroartesanal Puerto La boca del Recinto Puerto la Boca belonging to the parish Puerto Cayo of the canton Jipijapa, located at a latitude of 1°18'20"S and longitude: 80°45'42" W, at an altitude of approximately 53 msnm, an annual temperature of 24.8 °C and an annual precipitation of 298 mm (Gabriel et al., (2020 a).

Experiment management

The preparation of the soil inside the greenhouse was done manually, first, the removal and weeding of the soil was carried out. Organic matter (biocompost) was applied to provide adequate soil for the plants at the time of transplanting. The biocompost was applied at a rate of 75

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kg per 33 m row. Then, the land was measured with a tape measure and wooden stakes at , for the formation of the 0.50 m wide by 33 m long strips.

The substrate was prepared with biocompost, guava leaf and local soil in a 2:1:1 ratio. Ten kilograms of humus and a bag (10 g) of mycorrhiza were added to avoid the attack of pathogens that cause *damping off*. Once the substrate was prepared, the holes were filled with it, taking care to moisten it. Then the seeds of the parent plants were sown in these trays. The trays were irrigated twice a day to maintain humidity. To prevent disease attack, a broad-spectrum fungicide was applied.

The transplanting was done in rows, for which holes were dug with a depth of 0.15 m at a distance of 0.30 m between plants within the row and a distance of 1.50 m between rows, then proceeded to the transplanting of one plant per hole having 10 plants per factor and 110 plants per row. The chemical insecticides were applied to the plants with different treatments for each repetition, which consisted of six weeks intercalating them for the prevention of pests.

Pruning was performed on a single main branch and eliminating the remaining branches. Old leaves and shoots were removed to avoid the formation of other secondary branches. Trellising was performed after pruning, and a contact fungicide was applied after each pruning to avoid diseases from the wounds caused by this work. The plants were irrigated inside the greenhouse using a drip irrigation system and the frequency of use was three times per week. Harvesting was carried out 120 days after planting the melon crop.

Experimental design

The treatments evaluated (Table 1) were distributed in a completely randomized block experimental design with four replications. The design allowed blocking the effect of sunlight in the greenhouse on the experimental units. Each experimental unit consisted of three rows. Each row/treatment had 41 plants and the experimental unit for each treatment was 124 plants. Of these, 10 plants were chosen at random from each experimental unit in each repetition for the study of the response variables. A total of 160 plants were evaluated. The plants were transplanted to the final site at 0.20 m between plants and 1.20 m between rows. A total of 1980 plants were planted in the experiment.

Table 1. *Chemical treatments used for the control of insect pests in the*

agricultural period 2019, Puerto la Boca

Code	Treatment
T1:	Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application)
T2:	Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application)
T3:	Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application)
T4:	Witness (water)

Source: Parrales and Gabriel (2022)

The treatments detailed in Table 1 were applied alternately every seven days, starting with the systemic insecticide, and seven days later the contact insecticide was applied. This procedure was followed for six consecutive weeks, avoiding the use of the systemic insecticide on more than three occasions, to prevent the selection of resistant populations of pest insects. It should be mentioned that neen (natural insecticide) was used as a possible ecological alternative to replace the contact insecticide.

Plant height (cm), stem diameter (mm), number of nodes, number of fruits, fruit volume (cm^3), fruit weight (kg), pest insect identification and number were evaluated in the experiment. For the capture and identification of pest insects, yellow traps (trays) were placed with water and detergent, which were evaluated before and after the application of each treatment. The insects were identified using a magnifying glass and compared with reference keys (Rodríguez Rodríguez & Téllez Navarro, 2016; Castro, 2022).

For the data collection of the response variables, the central row was considered in order to avoid the edge effect; ten plants were randomly selected in these rows.

To determine the benefit/cost of the treatments, varying costs were considered, in order to perform a partial budget analysis with these data. This benefit/cost analysis allowed to determine the profitability or not of the treatments (Boardman et al., 2018).

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Statistical analysis

In the agronomic evaluations, once the data satisfied the assumptions of normality and homogeneity of variance, they were analyzed under the additive linear model of a completely randomized block experimental design suggested by Gabriel et al. (2021). Based on the defined model, analyses of variance were performed to test hypotheses about fixed effects, as well as comparisons of treatment means using the Tukey test at $P<0.05$ probability. The analysis of variance was also used to estimate the variance components for random effects. The indicated analyses were performed using Proc GLM from SAS University (Cod, 2018), which is open access.

Results

Normality and homogeneity of variances of the variables evaluated.

The analysis of normality and homogeneity of variances showed that the means were homogeneous, where the Chi-square test was not significant ($P<0.01$), which confirmed the continuation of the analysis of variance. The coefficient of variation (CV) of the variables evaluated were between 13% and 26% (Table 2), indicating that they were within the ranges allowed for this type of research.

Table 2. Analysis of variance for the number of pest insects determined in the period 2019, Puerto La Boca.

FV	Gl	Mean squares					
		NE	MMIN	PUL	POL	TRIPS	MBL
repetitions	3	18,39	11,08	1,28	45,73	28,17	75,06
Treatments	3	86,06*	52,91**	3,45**	54,73**	730,17**	21,28ns
error	9	21,84	7,53	0,28	5,39	32,77	42,89
total	15						
CV (%)		13,52	21,31	26,18	20,09	21,60	24,78

NE: blackfly (*Prodiplosis longifilia*), MMIN: leafminer *(Liriomyza sp.*), PUL: aphid *(Myzus persicae*), POL: moth (*Diaphania* sp.), TRIPS: thrips (*Frankliniella* sp.), MBL: whitefly *(Bemisia* sp.).

The analysis of variance for pest insects (Table 2), determined that in the number of pest insects present there were highly significant differences. This would indicate that at least one of the treatments was different for the blackfly - *Prodiplosis longifilia* (NE), leafminer - *Liriomyza sp.*) (MMIN), aphid - *Myzus persicae* (PUL), moth -

Diaphania sp. (POL) and thrips - *Frankliniella* sp. (TRIPS), except for the whitefly - *Bemisia* sp. (MBL) which did not show significance.

The analysis of the means of the number of insects determined for the variables NE, MMIN, PUL, POL and TRIPS with 32, 10, 0, 9 and 16 insect-pests captured respectively, were significant in reference to the control T4, which showed 42, 18, 8, 8, 17 and 46 insects captured respectively (Table 3). With respect to MBL, there were no significant differences between treatments.

Table 3. Comparison of means of the number of pest insects determined in the period 2019, Puerto La Boca.

Treatment	NE	MMIN	PUL	POL	TRIPS	MBL
T4	42 b	18 b	8 b	17 b	46 b	876 a
T1	33 a	12 ab	6 b	11 a	25 a	842 a
T3	32 a	12 a	4 ab	10 a	19 a	697 a
T2	32 a	10 a	0 a	9 a	16 a	545 a
DSH	10,32	6,05	4,74	5,13	12,64	697,57

Equal letters show no significant difference at P<0.05 probability, **1:** Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application), **2:** Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application), **3:** Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application), **4:** Control (water). NE: Neen (*Prodiplosis longifilia*), MMIN: leafminer (*Liriomyza sp*.), PUL: aphid *(Myzus persicae*), POL: moth (*Diaphania* sp.), TRIPS: thrips (*Frankliniella* sp.), MBL: whitefly (*Bemisia* sp.).

In this research it was found that T2 in which an alternate application is made between a systemic insecticide (Thiamethoxan+lamda cyhalothrin) and a contact insecticide (Confidor or Avemectin) and/or neen instead of the contact insecticide, is a good practice and allowed the control of up to 40% of pest insects such as NE, MMIN, PUL, POL, TRIPs and MBL (Table 1). These insect pests were mentioned by Chirinos et al. (2020) as the most important for vegetable crops in Ecuador. With this strategic proposal, in addition, the number of applications was lowered to a maximum of six times during the entire crop cycle, from the 20 or more applications made in the area (Vargas et al. 2016; Chirinos et al., 2020). In addition, it was determined that the application of T2 treatment improved product yield, achieving

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better benefits for producers, contributing to their health and the environment (INTAGRI, 2020).

Agronomic and yield characteristics

The kolmogorov-Smirnov test for normality and the chi-square test for homogeneity of variances showed no significant differences, indicating that the data had normal distribution and homogeneity of variances.

The analysis of variance for agronomic yield traits (Table 4), were highly significant (P<0.01 probability). This would indicate that, AP, DT, NN, NFT, NFF, NFR, VF and PF at least one of the treatments was different. It was determined that the CV of the evaluated variables are between 0.72 and 13.07 %, indicating that they are within the ranges allowed for this type of research.

Table 4. Analysis of variance for agronomic and yield traits in 2019, Puerto La Boca.

FV	gl	Mean squares							
		AP	DT	NN	NFT	NFF	NFR	VF	PF
repetitions	3	7,57	0,0001	1,03	1,79	0,052	0,01	231438,19	0,004
Treatments	3	60,69**	1,27**	4,94*	25,98**	1,60**	0,35**	11878815,58**	0,140**
error	9	2,09	0,01	0,74	1,64	0,04	0,02	93640,91	0,010
total	15								
C.V. (%)		0,72	2,63	3,98	6,42	6,77	10,90	6,20	13,107

AP: plant height, DT: stem diameter, NNodes: number of nodes, NFflower: number of flowers, NFF: number of fertilized flowers, NFfruit: number of fruits, VF: fruit volume, Weight: fruit weight, *Significant at P<0.05 probability, **: Highly significant at P<0.01 probability.

The analysis of means of agronomic and yield traits performed by Tukey's multiple comparison for the PA variable showed significant differences (P<0.05), indicating that T2 performed better (reaching a mean height of 2.05 m), with respect to the control (T4), revealing a height of 1.96 m (Table 5).

For stem diameter (SD), it was observed that treatment 2 was highly significant (Table 2), obtaining a mean diameter of 4.92 mm compared to the control (T4), which obtained a mean of 3.64 mm. In the variable of number of nodes (NNodes) significant differences were observed (P<0.05 probability), T2 obtained a mean of 23 nodes per plant with respect to T4 which had 20 nodes per plant.

For the total flower number variable, significant differences were observed (P<0.05 probability) (Table 5). Treatments T3 and T2 obtained an average of 22 flowers per plant with respect to treatment T4, which had 18 flowers/plant. For the total number of fertilized flowers (NFF), it was observed that treatment T3 was highly significant (Table 5), obtaining a mean of 4 fertilized flowers per plant with respect to the control T4 (2 fertilized flowers/plant). Significant differences (P<0.05 probability) were observed in the fruit number variable (Table 5), the T2 treatment had an average of 2 fruits/plant with respect to the control (T4), which had 1 fruit/plant.

Table 5. Mean comparison analysis for agronomic and yield traits in 2019, Puerto La Boca.

Treatment	AP	DT	NKnots	NFlor	NFF	NFruto	VF	Weight
T2	**205,85 a**	**4,92 a**	**22,97 a**	**22,00 a**	3,05 b	**1,67 a**	**6616,74 a**	**0,97 a**
T3	200,05 b	4,37 b	21.72 ab	**22,30 a**	**3,62 a**	**1,52 a**	**6181,95 a**	**0,89 a**
T1	199.05 bc	3,89 c	21.17 ab	17,95 b	2,40 c	1,12 b	4747,65 b	0,65 b
T4	196,68 c	3,64 d	20,32 b	17,55 b	2,25 c	1,07 b	3169,09 b	0,58 b
DSH	0,05	0,24	1,89	2,82	0,42	0,32	675,00	0,22

T1: Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application), **T2:** Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application), **T3**: Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application), **T4**: Control (water), AP: Plant height, DT: Stem diameter, NNodes: Number of nodes, NFflower: Number of flowers, NFF: number of fertilized flowers, NFruit: number of fruits, VF: fruit volume, Weight: fruit weight. *Significant at P<0.05 probability, **: Highly significant at P<0.01 probability.

For fruit volume (FV), significant differences were observed, the T2 treatment stood out with a mean of 6616.74 cm^3 in relation to the control (T4) which obtained a mean of 3169.68 cm^3. In fruit weight (FP), significant differences were observed (P<0.05 of probability), the superior treatment was for the T2 treatment with a mean of 0.96 kg of weight per fruit, in relation to T4 which reached a mean of 0.57 kg of weight per fruit.

From these results, it was determined that the chemical strategy T2 was the best to combat insect pests of melon (Cucumis *melo* L.) in greenhouses. This would contribute to reduce the indiscriminate use of

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pesticides to combat insect pests in Puerto La Boca Chirinos, 2020). The misuse of pesticides may be due to several factors, one of the main ones being that most farmers were not trained in the use and management of good pesticide management practices and do not have appropriate insect pest control strategies (Gabriel et al., 2023). It was evidenced in previous works (Gabriel et al., 2023), that in the Puerto la Boca area, farmers use twenty-four active ingredients of insecticides in powder and liquid form, which are under-dosed or over-dosed, which plays an important role in the acquisition of genetic resistance of pest insects to the insecticides used, generating increasingly resistant populations of the pest, which demands stronger and more toxic active ingredients (Chirinos et al., 2020; National Institute of Agricultural Technology [INTA], 2019). They also cause substantial losses in yields and product quality (Lindao et al., 2017).

The application of treatments T2, T3 and T4 identified the best chemical strategy with notable effects on agronomic traits such as plant height, stem diameter, number of nodes, number of flowers, number of fertilized flowers, and yield traits such as number of fruits, fruit volume and fruit weight (Table 5). It was also found that the strategies applied achieved better profitability of the fruit when sold in supermarkets and in supply markets (Table 6).

Benefit/cost (B/C) analysis of treatments

All treatments showed a B/C>1, when the product was marketed in the supermarket at \$0.50/kg fruit (Table 6). However, treatments T2 and T3 were the most profitable, with a B/C ratio of \$3.10 and \$2.76, respectively. This indicates that in the case of treatment T2, for each dollar invested, \$2.10 would be earned. With treatment T3, for each dollar invested, \$1.76 would be earned.

Table 6. B/C analysis of the treatments marketed in supermarkets in 2019, Puerto La Boca.

Trat	NP	P/C	PT/C	Pr/kg	Benefit	Cost	Net benefit	B/C	Profitability
T1	3135	0,65	2037,75	0,5	1018,88	371,15	647,73	1,75	Profitable
T2	3135	0,97	3040,95	0,5	1520,48	371,15	1149,33	3,10	Profitable
T3	3135	0,89	2790,15	0,5	1395,08	371,15	1023,93	2,76	Profitable
T4	3135	0,58	1818,30	0,5	909,15	371,15	538,00	1,45	Profitable

B/C > 1.0 = Profitable, **T1:** Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application), **T2:**

Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application), **T3**: Systemic insecticide (Thiamethoxan+lamda cyhalothrin) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application), **T4**: Control (water). NP: number of plants in 1000 m^2, P/C: weight per harvest in kg, PT/C: total weight per harvest in kg, Pr/kg: price per kg in US$ / B/C: benefit-cost ratio in US$.

When the product was marketed in the local supply market only treatments T2 and T3 were profitable with a B/C ratio of $1.46 and $1.26, respectively (Table 7).

Table 7. B/C analysis of the treatments marketed in the local supply market in the period 2019, Puerto La Boca.

Trat	NP	P/C	PT/C	Pr/Kg	Benefit	Cost	Net benefit	B/C	Profitability
T1	3135	0,65	2037,75	0,3	611,33	371,15	240,18	0,65	Not profitable
T2	3135	0,97	3040,95	0,3	912,29	371,15	541,14	1,46	Profitable
T3	3135	0,89	2790,15	0,3	837,05	371,15	465,90	1,26	Profitable
T4	3135	0,58	1818,30	0,3	545,49	371,15	174,34	0,47	Not profitable

B/C > 1.0 = Profitable, **T1:** Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Avemectin) 2.25 mL/L (alternate application), **T2:** Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Contact insecticide (Confidor) 0.60 g/L (alternate application), **T3**: Systemic insecticide (Thiamethoxan+cyhalothrin flame) 0.25 mL/L + Neen (organic) 4 mL/L (alternate application), **T4**: Control (water). NP: number of plants in 1000 m^2, P/C: weight per harvest in kg, PT/C: total weight per harvest in kg, Pr/kg: price per kg in US$. B/C: Benefit-cost ratio in dollars.

Conclusions

Of the three insect pest control strategies evaluated in the melon crop, the one that showed the best results was the T2 treatment, achieving a control of insect pests of up to 40%.

Treatment T2 allowed a higher profitability in the sale of melon fruit in supermarkets, achieving a profit/cost of $2.10 for each dollar invested. On the other hand, at the local wholesale market level, the same T2 treatment obtained a profit/cost of $1.46 for each dollar invested.

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