E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2025; 8(1): 951-955
Received: 23-10-2024
Accepted: 28-11-2024

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Herbicide options for management of *Wedelia* sps. and other weed species in Arecanut garden of coastal Karnataka

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DOI: https://doi.org/10.33545/2618060X.2025.v8.i1i.2503

Abstract
A field experiment was conducted during *rabi* 2023 at Farmer's field in Shirlal village of Karkala taluk, to study the "Herbicide Options for Management of *Wedelia sps.* and Other Weed Species in Arecanut Garden of Coastal Karnataka.'' The experiment was laid out in RCBD design including ten treatments consisting of eight post-emergent (PoE) herbicides, which are replicated thrice. The investigation revealed that the post-emergent application of 2,4 D sodium salt 80% WP @ 1250 g a.i. ha^{-1} at the 5-6 leaf stage showed a significantly lower weed density of *Wedelia* species (1.67, 2.00, 3.00, and 8.67 m^{-2}), whereas glyphosate 41% SL IPA salt showed significantly lower total weed density (7.67, 12.67, 31.33, and 41.67 m^{-2}), lower total weed dry matter production (9.37, 23.60, 37.83, and 47.27 g m^{-2}) and higher weed control efficiency (96.97, 95.16, 89.51 and 86.81%, respectively at 15, 30, 45 and 60 days after treatment incorporation (DATI). It was found to be on par with the post-emergent application of glyphosate 71% SG (ammonium salt) @ *a.i.* 2.13 kg ha^{-1}. Further, the application of glyphosate 41% SL IPA salt @ 1.230 kg ha^{-1} *a.i.* ha^{-1} has recorded a 63.66 per cent lower weeding cost of 3100 Rs ha^{-1} compared to the farmer's practice (Rs. 8530 ha^{-1}).

Keywords: Arecanut, glyphosate and *Wedelia*

1. Introduction
The areca nut palm, scientifically known as *Areca catechu* L., is a crucial commercial crop in India. The raw kernel is chewed in different forms and also processed into products like pan masala, gutkha and scented supari which have gained popularity nationwide [1]. In terms of area, Karnataka ranks first with 0.5 million hectares and a production output of 1.08 million tonnes. The Arecanut cultivation landscape in Coastal Karnataka is mostly found in Dakshina Kannada and Uttara Kannada districts, which together accounted for approximately 138,146 hectares in 2020-21. Udupi district is also a significant areca nut producer, with an area and production of 54,313 ha and 81,419 tonnes respectively at a productivity rate of 1.5 tonnes/hectare in 2020-21 [2].

Among production constraints in areca nut cultivation in the Coastal Karnataka region is weed infestation. In Coastal Karnataka, areca nut plantations are facing a significant threat from specific invasive weeds. Notably, *Wedelia trilobata* (L.) Hitchc., *Chromolaena odorata* (L.) R.M.King & H.Rob., *Eupatorium odoratum* (L.) R.M. King & H.Rob., *Mimosa pudica* L., *Ageratum conyzoides* L., *Acanthospermum australe* (Loefl.) Kuntze. and *Colocasia esculenta* (L.) Schott. are infesting gardens in coastal areas and causing substantial yield losses of 30-40 percent. Among different weeds, The *Wedelia trilobata* (L.) Hitchc., also known as Singapore Daisy poses a severe threat to arecanut farmers in coastal area regarding management practices, it is a fast-growing and low-climbing perennial herb native to Mexico, Central America, the Caribbean and Tropical South America. It belongs to Asteraceae family and is known for its spreading, mat-forming growth habit. The weed can grow up to 30 cm in height and develops roots at every node. Its fleshy leaves have irregular shapes with toothed or serrated edges and paired lateral lobes. Singapore Daisy produces vibrant yellow to golden-hued flowers year-

round, followed by inconspicuous, simple, and dry indehiscent fruits. It's worth noting that the seeds are non-viable, so the plant propagated vegetatively through stem fragments, which readily root and spread quickly [3].

The handpicking method is the most common way of harvesting areca nuts in coastal areas and the harvesting season starts from September to January. However, this crucial period coincides with the rapid spread of invasive species like *Wedelia trilobata* (L.) Hitchc. and other weeds, which presents significant challenges to farmers. By October, *Wedelia trilobata* can reach a height of two feet, making harvesting more difficult and competing with areca nut plants for nutrients and water. To deal with this weed, coastal farmers using brush cutters, but the plant's ability to multiply quickly through stem cuttings makes it hard to control. Additionally, the shade provided by *Wedelia trilobata* creates a habitat for snakes, which adds to the farmers' concerns. Despite its widespread presence and negative impact on agriculture, there has not been a comprehensive study on controlling the spread of *Wedelia trilobata* through post-emergent herbicide application. Farmers in Dakshina Kannada, Udupi, and Uttara Kannada districts are facing challenges in managing weeds due to limited awareness of post-emergent herbicides. This is further exacerbated by labour scarcity and high labour costs of ₹600 per day. This underscores the need for targeted research to reduce the effects of this invasive weed.

2. Materials and Methods

2.1 Site description

A field experiment was conducted during rabi 2023 at farmers field, Udupi district. The experimental site is situated at 13° 17′ N latitude and 75° 3′ E longitude at an altitude of 10 m above mean sea level. According to the NARP classification, it falls under Karnataka's Agro-Climatic Zone-X (Coastal Zone). The investigation site had sandy loam in texture, acidic pH (5.7) and non-saline (EC: 0.06 dSm^{-1}), medium in organic carbon (1.16%), medium in available nitrogen (280.57 kg ha^{-1}), medium in available phosphorus (27.83 kg ha^{-1}) and low in available potassium (109.7 kg K_2O ha^{-1}).

2.2 Experimental details

The field experiment was laid out in RCBD involving ten treatments and 3 replications. The treatments consist of 2, 4 D Sodium salt 80% WP post emergent at 5-6 leaf stage of *Wedelia species* @ 1250 g a.i. ha^{-1} (Selective) (T_1), Bentazone 48% SL post-emergent at 2-3 leaf stage of *Wedelia species* @ 960 g a.i. ha^{-1} (Selective) (T_2), Saflufenacil 70% WG post-emergent at 5-6 leaf stage of *Wedelia species* @ 52.5 g a.i. ha^{-1} (non-Selective) (T_3), Glyphosate 41% SL IPA salt post-emergent at 5-6 leaf leaf stage of *Wedelia species* @ 1230 g a.i ha^{-1} (non-Selective) (T_4), Glyphosate 71% SG (Ammonium Salt) post-emergent at 5-6 leaf stage of *Wedelia species* @ 2130 g a.i. ha^{-1} (non-Selective) (T_5), Paraquat dichloride 24% SL post-emergent at 5-6 leaf stage of *Wedelia species* @ 1000 g a.i. ha^{-1} (non-Selective) (T_6), Carfentrazone ethyl 0.43% a.i. 12.90 g ha^{-1} + Glyphosate 30.82% EW a.i. 924.60 g ha^{-1} post-emergent at 5-6 leaf stage of *Wedelia species* (Dosage 1200ml/ac) (non-Selective) (T_7), Oxyflurofen 2.5% + Glyphosate (IPA salt) 41% SC post emergent at 5-6 leaf stage of *Wedelia species* (Dosage 800 ml/ac) (non-Selective) (T_8), Weedy check (Absolute control) (T_9), Farmer's practice (Weed management through brush cutter at 6 to 7 leaf stage of *Wedelia sps* and subsequent at full weed growth stages i.e. 40-45 cm *Wedelia* weed height) (T_{10}).

The gross plot size was 13.5 x 13.5 m. Required herbicides were calculated based on the active ingredient in the commercial products to determine the quantities of various post-emergent herbicides needed for each treatment. The required amounts of herbicide and water were mixed thoroughly for each plot before application. A knapsack sprayer equipped with a flat-fan nozzle was utilized. To prevent cross-contamination, a fresh solution was prepared for each plot and the sprayer was rigorously cleaned with detergent powder and rinsed with fresh water after each herbicide's spray application across all three replications. The surfactant used was siliwet. The brush cutter used for farmer's practice was Gallop 4200 E 2-stroke.

2.3 Collection of experimental data

The efficacy of the herbicides was tested by taking the observation on category wise weeds *viz*. *Wedelia* species, other broad-leaved weeds, grasses and sedges, weed density, biomass and weed control efficiency at 15, 30, 45 and 60 days after treatment imposition (DATI) by using a quadrate (1 x 1 m) randomly in each plot. The weeds were uprooted from one m^2 area selected at random and were oven dried to a constant weight at 65°C and dry weight of weeds in each treatment was recorded and expressed as g per square meter. The total cost of weeding for various treatments was worked out including the cost of fulfilling the needs of different herbicides, labour and brush cutters to carry out weeding operations. The herbicide cost was calculated through the market prices prevalent at the time of spray. The treatment-wise weeding cost was calculated and presented in rupees ha^{-1}.

2.4 Statistical analysis and interpretation of data

The data collected for various observations of growth, weeds, and soil parameters were statistically computed after adopting Fisher's Analysis of Variance (ANOVA) as presented by Gomez and Gomez (1984). The normality of distribution was not seen in case of observation on weeds hence, the values were subjected to square root transformation ($\sqrt{x}$ + 0.5) before statistical analysis to normalize their distribution. Five per cent level of significance was applied in the 'F' test. The critical difference (CD) values were presented in the table at a five per cent level of significance wherever the 'F' test was significant.

3. Results and Discussion

3.1 Weed Flora

The predominant weed flora observed in the experimental field in association with the areca nut plantation includes, grassy weeds like *Digitaria adscendens*, *Panicum repens*, *Eleusine indica*, *Dactyloctenium aegyptium*, sedges like *Cyperus rotundus* and *Cyperus procerus*, broadleaved weeds like *Wedelia trilobata*, *Chromolaena odorata*, *Eupatorium odoratum*, *Mimosa pudica*, *Ageratum conyzoides*, *Acanthospermum australe*, and *Colocasia esculenta*. *Wedelia trilabata* and other broad-leaved weeds were the most dominant weed species followed by grasses and sedges. The dominance of these weeds in the areca nut plantation may be attributed to the sparse canopy of the areca nut trees, providing adequate light for weed growth and supplement irrigation that creates moist conditions for these weeds [4]. These results show a similar trend as findings of [5].

3.2 Initial weed density

The initial weed count (consisting of *Wedelia species*, other broad-leaved weeds, grasses and sedges) before the implementation of various weed management practices was found to be non significant and is presented in Table 1.

3.3 *Wedelia species* density

Table 2 indicates that the density of *Wedelia sps*. varied significantly in response to different weed management practices.

Among the different weed management practices, the application of 2,4 D sodium salt 80% WP @ 1250 g a.i. ha^{-1} at the 5-6 leaf stage showed a significantly lower density of *Wedelia* species (1.67, 2.00, 3.00, and 8.67 m^{-2}) followed by post- emergent application of glyphosate 41% SL IPA salt @ 1230 g a.i. ha^{-1} at 5-6 leaf stage (5.67, 14.67, 15.67, and 19.33 m^{-2}) at 15, 30, 45, and 60 days after treatment imposition, respectively). Similar results were observed with the application of post-emergent glyphosate 71% SG (ammonium salt) @ 2130 g a.i. ha^{-1}, which resulted in densities of 6.33, 17.00, 19.33, and 23.00 m^{-2}. The highest density of *Wedelia* species was observed in the weedy check treatment (163.33, 185.33, 204.33, and 206.00 m^{-2}), followed by the farmer's practice treatment (74.00, 146.67, 175, and 135 m^{-2} at 15, 30, 45, and 60 days after treatment imposition, respectively).

At the 5-6 leaf stage (Treatment T1), the application of 2,4-D sodium salt 80% WP at a concentration of 1.25 kg a.i. ha^{-1} resulted in the most significant reduction in the density of *Wedelia trilobata*. This effective control is attributed to the uptake of 2,4-D by the foliage and stems of *Wedelia sps*. followed by its translocation to the growing meristematic regions. Here, 2,4-D acts as an auxin analogue, disrupting normal cellular processes by interfering with mitotic division and growth regulation. This auxin mimicry leads to aberrant cell proliferation and uncontrolled growth, ultimately suppressing the weed. The herbicide exhibits selective activity by targeting broadleaf species while leaving grasses and sedges largely unaffected, thereby enhancing its specificity and efficacy. The mode of action involves the absorption into leaf and stem tissues, followed by auxin-like effects that induce excessive cellular growth and tissue proliferation, culminating in the demise of the weed.

This study represents a noteworthy progression in weed management strategies, as it evidences that the application of 2,4-D sodium salt 80% WP @ 1250 g a.i. ha^{-1} substantially control *Wedelia trilobata*, establishing it as an effective standalone control method. The findings are consistent with the results reported by [3], thereby reinforcing the validity and efficacy of this herbicidal approach.

3.4 Total weed density

At 15, 30, 45, and 60 days following the application of post-emergent glyphosate 41% SL IPA salt @ 1230 g a.i. ha^{-1} during the 5-6 leaf stage (T4), the treatment exhibited superior efficacy in controlling all weed types, including grasses, sedges, and broadleaf
species. This effectiveness was indicated by progressively lower total weed densities, recorded as 7.67, 12.67, 31.33, and 41.67 weeds m^{-2} at 15, 30, 45, and 60 days after treatment imposed, respectively (Table 3).

The lowest total weed density with T_4 was attributed to broad-spectrum action of the herbicide. It inhibits the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), which is crucial for plant growth and development. Glyphosate disrupts the shikimate pathway, a vital metabolic route for the synthesis of aromatic amino acids, vitamins, and other essential compounds. This inhibition halts amino acid production, causes the accumulation of toxic metabolites, disrupts protein synthesis and ultimately leads to weed death. As a systemic herbicide, glyphosate is absorbed through the plant's leaves or roots and translocated to the meristematic tissues (growth points), where it interferes with critical enzymes and kills the plant, thus reduced density of diverse weed species. These observations are aligned with the findings of [4] and [6].

3.5 Total weed dry weight

In Table 4, the data displays the total dry matter production of weeds at different time intervals (15, 30, 45, and 60 days after treatment imposition) as influenced by various weed management practices.

Among the various weed management practices, the application of the post-emergent herbicide glyphosate 41% SL IPA salt @ 1230 g a.i. ha^{-1} during the 5-6 leaf stage (T4) resulted in a significantly reduced total weed dry weight (9.37, 23.60, 37.83, and 47.27 m^{-2}) at 15, 30, 45, and 60 days after treatment imposition, respectively. This improved weed control efficacy is evident from the effective suppression of all weed types, including grasses, sedges, and broadleaf species, which led to decreased weed populations and dry weights, and enhanced overall weed control efficiency. This effectiveness is attributed to the systemic action of glyphosate 41% SL IPA salt, which is absorbed by the plants through their leaves or roots, translocated to the meristematic tissues (growth points), where it inhibits essential enzymes, leading to the death of the plants. Consequently, this results in a lower density of complex weed flora. These findings are in agreement with the studies of [7] and [4].

3.6 Weed Control Efficiency (%) for total weeds

Weed Control Efficiency (WCE) refers to the effectiveness of applied herbicide or treatment in reducing the dry weight of weeds. Table 5 presents the weed control efficiency of total weeds as influenced by various weed management practices at 15, 30, 45, and 60 days after treatment imposition.

A notably higher total WCE was observed with treatment (T4), involving the application of the post-emergent herbicide glyphosate 41% SL IPA salt @ 1230 g a.i. ha^{-1} at the 5-6 leaf stage (96.97%, 95.16%, 89.51% and 86.81% WCE), which was on par with the post-emergent herbicide application of glyphosate 71% SG (ammonium salt) @ 2130 g a.i. ha^{-1} (96.45%, 94.14%, 88.50%, and 85.44% WCE) at 15, 30, 45 and 60 days after treatment imposition, respectively. The lowest weed control was obtained with the farmer's practice treatment (T10) (48.00%, 45.00%, 41.00% and 28.50% at 15, 30, 45 and 60 days after treatment imposition, respectively). The improved weed control efficacy is evident from the effective suppression of all weed types, including grasses, sedges, and broadleaf species, which led to decreased weed populations and dry weights, and enhanced overall weed control efficiency. This effectiveness is attributed to the systemic action of glyphosate 41% SL IPA salt, which is absorbed by the plants through their leaves or roots, translocated to the meristematic tissues (growth points), where it inhibits essential enzymes, leading to the death of the plants [4].

3.7 Economics of weed management to control *Wedelia* species and other weeds

Among the post-emergent herbicide treatments, the lowest weeding cost was observed in treatment (T1), which utilized post-emergent 2,4-D sodium salt 80% WP at a rate of 1.25 kg a.i. ha^{-1} during the 5-6 leaf stage, amounting to Rs. 2,300 per hectare (Figure 1). This was followed by treatment (T4), which applied the post-emergent herbicide glyphosate 41% SL IPA salt at 1.230 kg ha^{-1} a.i. during the same leaf stage, incurring a cost

of Rs. 3,100 per hectare. While treatment (T1) effectively controlled only broadleaf weeds, treatment (T4) provided comprehensive weed management by targeting a wider range of weeds, including *Wedelia* species, grasses, sedges, and other broadleaf weeds. This treatment demonstrated the highest weed control efficiency among the post-emergent herbicide options, making it both beneficial and economical compared to the traditional farmer's practice. The latter involved using a brush cutter to remove weeds at the 6-7 leaf stage and again at a height of 30 to 40 cm for *Wedelia* species, which generally incurs higher costs and labour demands.

The farmer's practice (T10) resulted in the highest weeding cost of Rs. 8,530 per hectare, primarily due to the increased labour requirements and the necessity for two rounds of brush cutter weeding to manage the growth of *Wedelia* species during the two-month nut harvesting period. This intensive labour approach not only escalates costs but also demands significant time and effort from farm workers.

The study's results indicated that the farmer's practice is costly due to high labour expenses and frequent weeding requirements. In contrast, applying glyphosate 41% SL IPA salt at 1.230 kg ha^{-1} (a.i.) during the 5-6 leaf stage led to a 63.66% reduction in costs compared to the traditional farmers' practice (T_{10}) while effectively controlling weeds in areca nut plantations. These findings are consistent with those reported by [4] and [8].

Table 1: Initial weed counts (No. m-2) before application of different weed management practices

Treatments	*Wedelia sps.*	OBLW	Grasses	Sedges
T1	112.00	18.00	25.00	9.00
T2	108.67	17.67	25.67	8.67
T3	110.67	19.33	25.33	8.33
T4	109.00	18.33	28.67	9.00
T5	113.00	18.33	24.67	8.67
T6	113.33	16.67	26.67	9.33
T7	107.67	15.33	25.33	9.00
T8	115.67	16.33	25.00	8.33
T9	116.00	18.33	26.33	9.33
T10	111.67	17.67	26.00	8.67
S.Em (±)	0.98	0.32	0.27	0.11
C.D (P =0.05)	NS	NS	NS	NS

Table 2: Density of *Wedelia sps.* (No. m^{-2}) as influenced by different weed management practices at 15, 30, 45 and 60 days after treatment imposition (DATI)

Treatments	15 DATI	30 DATI	45 DATI	60 DATI
T1	1.39(1.67)	1.47(2.00)	1.86(3.00)	3.02(8.67)
T2	10.53(110.33)	11.09(122.67)	11.49(131.67)	11.51(132.00)
T3	5.40(28.67)	9.28(85.67)	10.09(101.33)	10.20(103.67)
T4	2.47(5.67)	3.70(14.67)	3.91(15.67)	4.43(19.33)
T5	2.60(6.33)	4.18(17.00)	4.40(19.33)	4.83(23.00)
T6	2.85(7.67)	5.10(26.00)	5.43(29.00)	5.69(32.00)
T7	8.90(79.33)	9.42(88.33)	9.68(93.33)	10.33(106.33)
T8	9.21(84.67)	9.67(93.00)	9.87(97.00)	10.81(116.33)
T9	12.80(163.33)	13.63(185.33)	14.31(204.33)	14.37(206.00)
T10	8.63(74.00)	12.13(146.67)	13.24(175.00)	11.64(135.00)
S.Em (±)	0.24	0.36	0.25	0.22
C.D (P = 0.05)	0.78	1.15	0.81	0.63

Note: Data subjected to $\sqrt{X}$ + 0.5 transformation and figures in parentheses indicate original vaues, DATI – Days after treatment imposition, PoE - Post-emergent herbicide

Table 3: Total weed density (No m^{-2}) at 15, 30, 45, and 60 days as influenced by different weed management practices after treatment imposition

Treatments	15 DATI	30 DATI	45 DATI	60 DATI
T_1	5.90(34.33)	6.59(43.00)	7.60(57.33)	8.55(72.67)
T_2	12.02(144.00)	12.35(152.00)	13.93(196.67)	14.51(210.00)
T_3	7.93(62.33)	11.02(121.00)	12.43(154.00)	13.17(173.00)
T_4	2.85(7.67)	3.61(12.67)	5.61(31.33)	6.48(41.67)
T_5	3.05(9.00)	3.96(15.33)	5.89(34.33)	6.82(46.00)
T_6	4.06(16.00)	6.60(43.33)	7.87(61.67)	8.32(68.70)
T_7	10.08(101.33)	10.95(119.33)	12.37(152.67)	13.25(175.00)
T_8	10.39(107.67)	10.99(120.33)	12.29(150.67)	13.43(180.00)
T_9	15.93(253.33)	16.19(261.67)	17.30(298.67)	17.79(316.00)
T_{10}	11.47(131.00)	14.44(208.00)	15.73(247.00)	15.11(228.00)
S.Em (±)	0.2	0.17	0.21	0.17
C.D (P = 0.05)	0.64	0.56	0.67	0.56

Note: Data subjected to $\sqrt{X}$ + 0.5 transformation and figures in parentheses indicate original values

Table 4: Total weed dry matter production (g/m^2) at 15, 30, 45, and 60 days as influenced by different weed management practices after treatment imposition.

Treatments	15 DATI	30 DATI	45 DATI	60 DATI
T_1	41.30	51.63	68.83	87.20
T_2	173.03	196.23	232.70	240.00
T_3	75.23	152.57	182.47	207.60
T_4	9.37	23.60	37.83	47.27
T_5	11.20	25.87	40.83	55.20
T_6	19.07	52.00	75.90	77.17
T_7	121.63	143.30	163.40	201.97
T_8	138.77	153.00	181.33	216.00
T_9	309.33	318.60	358.43	373.13
T_{10}	162.40	249.50	265.33	285.47
S.Em (±)	3.82	4.13	4.20	4.32
C.D (P = 0.05)	12.23	13.23	13.45	13.45

Table 5: Total weed control efficiency (*Wedelia sps*, OBLW, grasses, and sedges) (%) at 15, 30, 45 and 60 days as influenced by different weed management practices after treatment imposition

Treatments	15 DATI	30 DATI	45 DATI	60 DATI
T_1	68.39(86.44)	66.09(83.57)	64.01(80.80)	61.34(77.00)
T_2	41.07(43.16)	40.34(41.91)	36.36(35.15)	35.35(33.48)
T_3	60.26(75.39)	47.16(53.76)	44.10(48.43)	42.27(45.25)
T_4	79.98(96.97)	77.29(95.16)	71.10(89.51)	68.70(86.81)
T_5	79.14(96.45)	75.99(94.14)	70.18(88.50)	67.57(85.44)
T_6	75.44(96.38)	65.99(83.44)	62.97(79.35)	62.21(78.26)
T_7	50.77(60.00)	47.52(54.44)	44.36(48.88)	41.91(44.62)
T_8	49.31(57.5)	47.29(54.00)	44.74(49.55)	41.00(43.04)
T_9	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)
T_{10}	43.85(48.00)	42.13(45.00)	39.82(41.00)	32.27(28.50)
S.Em (±)	0.9	0.57	0.76	0.82
C.D (P=0.05)	2.88	1.81	2.44	2.61

Note: Data subjected to arc sine transformation and figures in parentheses indicate original vaues

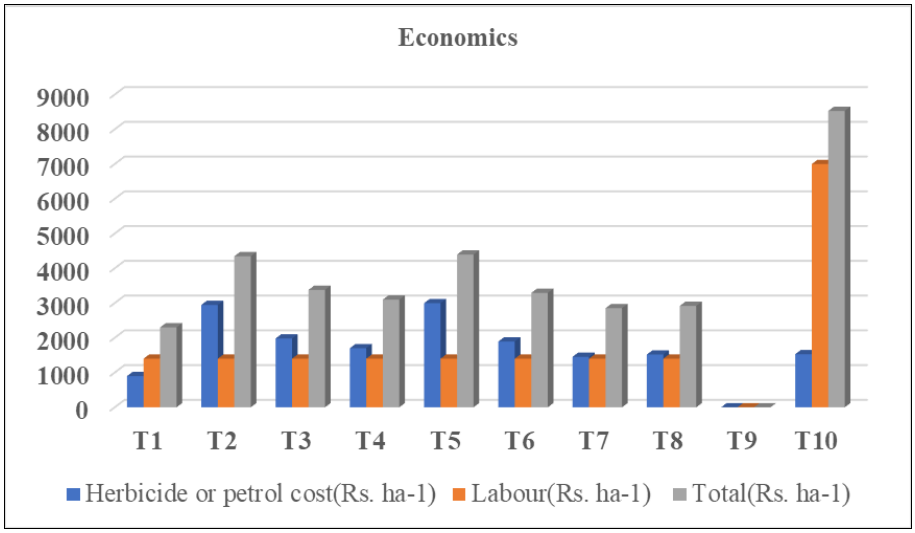

Fig 1: Economics of *Wedelia sps* and other weeds managed through different weed management treatments in areca garden for two months (Rs. ha-1)

4. Conclusion

The investigation into herbicide options for managing *Wedelia* species and other weeds in the areca nut gardens of coastal Karnataka yielded significant findings. The study identified *Wedelia trilobata* as the predominant weed species, competing with arecanut plants for vital resources. Among the various post-emergent herbicides tested, glyphosate 41% SL (IPA salt) @ 1230 g a.i. ha^{-1} or glyphosate 71% SG (ammonium salt) @ 2130 g a.i. ha^{-1} proved to be the most effective in reducing both weed density and dry matter production. Overall, the study concluded that post-emergent herbicide application of Glyphosate 41% SL (IPA salt) @ 1230 g a.i. ha^{-1} at 5-6 leaf stage (T_4) was found as an effective and economical solution for controlling *Wedelia trilobata* and other weed species in areca nut plantations in Coastal Karnataka and can be recommended.

5. Competing interests

The authors have declared that no competing interests exist.

6. References

1. Desai ND, Sukanya TS, Mamatha B. Problems experienced by farmers in arecanut cultivation. Asian J Hortic. 2016;2:301-5.
2. Anonymous. Area, production, and productivity of areca nut cultivation in Karnataka [Internet]. Available from: http://raitamitra.karnataka.gov.in/index.html. Accessed: 18 Mar 2024.
3. Prameela P, Antony S, Sreelakshmi K, Krishna VR. Management of Singapore daisy (*Sphagneticola trilobata*) in plantations. Pestic Res J. 2022;34:222-5.
4. Gangaiah B, Roy SD, Subramani T, Swarnam TP, Velmurugan A, Swain S. Weed management in plantation crops and cropping systems of Andaman & Nicobar Islands. 2015:384.
5. Dagar JC, Gangwar B, Sharma AK. Distribution and integrated management of weeds in Bay Islands. J Andaman Sci Assoc. 1991;7(1):31-52.
6. Chauhan G. Efficacy of glyphosate salt formulations against weeds in tea (*Camellia sinensis* (L) Kuntze) [Doctoral dissertation]. Palampur; 2021.
7. Senarathne SHS, Samaraajeeva AD, Perera KCP. Comparison of different weed management systems and their effects on yield of coconut plantations in Sri Lanka. Weed Biol Manag. 2003;3(3):158-61.
8. Joseph P, Jessy MD. Agro-economic evaluation of different weed control methods in rubber plantations. J Plantation Crops. 2013;41(3):380-3.