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Management of Invasive Golden Dodder (*Cuscuta chinensis*) in Rice-fallow Pulse Agro-ecosystem of Tamil Nadu Through Chemical Weed Control Practices

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ABSTRACT

Background: Invasive golden dodder incidence poses a serious threat to rice-fallow pulse agro-ecosystems of Tamil Nadu, reducing crop growth, yield and profitability. Effective chemical weed management strategies are essential to suppress this parasitic weed and sustain pulse productivity in rice fallow systems.

Methods: Field experiments were conducted during the rice fallow summer seasons of 2024 and 2025 (January-March) at ICAR-Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Thiruvarur district of Tamil Nadu. The experiment was conducted in a randomized block design (RBD) with three replications. The experimental field was observed with notable invasion of dicot weed flora golden dodder (*Cuscuta chinensis*) for the past three years prior to that there was no such incidence. The treatments consisted T_1- Pre-emergence application of pendimethalin @ 1.0 kg ha^{-1}; T_2- EPoE application of fluazifop–p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1}; T_3- EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1}; T_4- EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1}; T_5- Weed free and T_6- Unweeded control. The green gram cultivar ADT 3 was taken up in the experiment for study.

Result: The EPoE application of fluazifop–p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} on 25 DAS resulted in less dry matter production of dodder on 30 DAS (1.86 g m^{-2}) and the same treatment restricted the further growth, establishment and dry matter production of dodder to nil (0.0 g m^{-2}) at 60 DAS. Similarly the same treatment also recorded higher grain yield (710.5 kg ha^{-1}), gross return (49104 ₹ ha^{-1}) and B:C ratio (2.45). Hence, it is recommended that EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} on 25 DAS in rice fallow pulse (green gram) for effective golden dodder management and sustaining the productivity and profitability of the agro-ecosystem.

Key words: Golden dodder, Green gram, Herbicide, Rice fallow, Weed management.

INTRODUCTION

Pulses are known for their role in nutritional security and sustainability of agricultural production systems and agro-ecology. The country's vegetarian population relies on it as a primary source of protein. India is the largest producer, consumer and importer of pulses. But, productivity of pulses in India, however, lags significantly behind that of other countries globally. The government of India predicts that total pulses production would be 242.46 lakh tonnes in 2023-24, down 5.39 lakh tonnes from the average of 247.85 lakh tonnes during the previous five years (GOI, 2025). The low productivity of pulses in India is mainly due to several biotic and abiotic factors among which weeds are major ones since they severely affect the pulse crops yield. The entry of non-native species into a region can have a devastating effect on native flora and fauna, leading to altered ecosystems and a loss of biodiversity (Arun *et al.,* 2022). Biological invasion is a leading source of global environmental change that has far-reaching ecological consequences. The continued threat to global food security from invasive alien plant species has the ability to have far-reaching consequences for agriculture around the world (Fleming *et al.,* 2021). Numerous biological features pertaining to high fecundity and stress tolerance are shared by the invasive alien plants,

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sometimes known as weeds. The characteristics encompass a variety of processes for dispersal, including seed germination, quick seedling development, early sexual and vegetative reproduction, tolerance of different environmental conditions and aggressive dissemination by runners or climbers. Extreme weather, changes in rainfall patterns, increased levels of carbon dioxide and nitrous oxide in the atmosphere and other climatic changes have the potential to hasten the spread of invasive plant species. Numerous processes contribute to invasive plants negative impact on agricultural output, including seed germination suppression, reduced crop yields, allelopathy impacts and competition for water, nutrients and light. Because of the damage it does to ecosystems and natural biodiversity, plant invasions pose a major danger to biodiversity on a worldwide scale. An ecological explosion occurs when invasive plants cause a complicated metamorphosis in the ecology of the landscape. Change is occurring rapidly in developing countries worldwide. Damage to native ecosystems, altered ecosystems, decreased native plant quantity and richness and changed community structure are all results of invasive weeds (Clements and Jones, 2021). *Cuscuta*, or golden dodder, is a genus of rootless, stem parasitic weeds that cause significant crop damage by extracting water and nutrients from host plants using specialized structures called haustoria. Identified by thin, often yellow or orange, leafless stems, golden dodder can cause severe yield reductions in crops like pulses, oilseeds and alfalfa. This holoparasitic plant, which lacks roots and depends entirely on its host for nutrients, can severely reduce crop yields and quality. The incidence of golden dodder (*Cuscuta chinensis*) was first reported in Tamil Nadu by Srinivasan (1973). As a parasitic plant, its seeds are often a contaminant in agricultural crops, reducing yield and quality and are subject to strict regulations in many countries due to their noxious weed status. Golden dodder infestations are particularly problematic in rice-fallows where green gram is often grown. Golden dodder is an invasive species in many regions in India and especially in rice fallow regions in cauvery delta zone (CDZ). Furthermore, most of the pulses are cultivated as rainfed crops with no or minimal inputs and inadequate weed management. Limited attention was paid in the past by researchers also on development of effective strategies to manage golden dodder weeds in pulses. Only a few herbicides are registered in India for use in pulses and most of the weed management recommendations in pulses are of pre-emergence herbicide application followed by manual weeding. However, innovative approaches incorporating early post-emergence herbicides were also necessary for efficient weed management in pulses as a result of a lack of labour for intercultural operations.

MATERIALS AND METHODS

The field experiment was conducted for two consecutive years without altering the layout at the ICAR-Krishi Vigyan Kendra, Needamangalam Tamil Nadu Agricultural University, Thiruvarur, India, situated at coordinates 10°40′N latitude, 79°09′E longitude and an altitude of 54.26 m. The experimental site was clay loam in texture, medium in organic carbon (0.50%), low in available nitrogen (N; 190.0 kg ha^{-1}), moderate in available phosphorus (P_2O_5; 20.15 kg ha^{-1}) and available potassium (K_2O; 220.1 kg ha^{-1}), with a pH of 6.7 and EC of 0.221 dS m^{-1}. Line sowing (30 × 10 cm) of green gram (ADT 3) was carried out by manual dibbling on 10.01.2024 and 16.01.2025 under waxy soil moisture conditions as a relay crop after harvesting rice to ground level, primarily to facilitate herbicide spraying for the fallow crop, as per the treatments in green gram and the crop was harvested on 20.03.2024 and 28.03.2025 respectively. The experiment was taken up in a randomized block design (RBD) with three replications as per the following treatment schedule T_1- Pre-emergence application of pendimethalin 1.0 kg ha^{-1}; T_2- EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @250 g ha^{-1}; T_3- EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1}; T_4- EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1}; T_5- Weed free and T_6- Unweeded control. The pre-emergence (PE) herbicide applied on 3 days after sowing and early post emergence (EPOE) herbicide applied on 3-5 leave stage of both monocot and dicot weeds which coincided on 25 days after sowing (DAS) in rice fallow ecosystem with battery operated sprayer fitted with flat fan nozzle. The weather data during the experimental period were recorded from the meteorological observatory located at ICAR-Krishi Vigyan Kendra, Needamangalam. The mean weekly maximum and minimum temperature during both the cropping period ranged from 28 to 35°C with an average of 33°C and 15 to 19°C with an average of 17.5°C respectively. The mean relative humidity (RH) during the crop growth period varied from 82.42 to 93.76% with an average of 87.31% in the morning and varied from 40.50 to 64.38% with an average of 55.69% in the afternoon.

Plant height

The height of the plant was measured from the ground level to the growing tip of the observation plants and the mean was worked out and expressed in cm.

No. of branches per plant

The number of branches per plant was computed from the tagged plants and the mean was worked out.

Leaf area index (LAI)

Leaf area index (LAI) was worked out using the formula suggested by Watson (1947).

$$\text{Leaf area index} = \frac{\text{Total functional leaf area plant}^{-1}}{\text{Land area occupied plant}^{-1}}$$

SPAD Chlorophyll meter reading (SCMR)

The chlorophyll content was measured at the peak vegetative state (45 days after sowing) in 3rd leaf from the

top from 10.30 am to 12.30 pm using a Minolta Model 502 SPAD Meter.

Number of pods per plant

Total number of pods from tagged plants from each plot were counted and averaged to get number of pods per plant.

100-seed weight

From the seed obtained from the tagged plants, 100 seeds were counted, oven dried and their weights were recorded as test weight and expressed in gram.

Crude protein content of the seed (%)

Nitrogen content in seeds of green gram were analyzed and percentage crude protein in the seed was calculated by multiplying the percentage of nitrogen with the factor 6.25 (Simpson *et al.,* 1965).

Grain yield

Crops were harvested manually leaving five centimetres above the ground and separated the grains and stover by threshing the separated grains were recorded as grain yield.

Dry matter production of *Cuscuta*

The *Cuscuta* in the quadrat were collected and air dried. Dry weight of the weeds from each treatment was recorded after oven-drying at 70±5°C to constant weight. The observations recorded at 30 DAS and 60 DAS and expressed in g m^{-2}.

***Cuscuta* control efficiency**

Cuscuta control efficiency was calculated as per the procedure suggested by Main *et al.* (2007).

$$CCE\ (\%) = \frac{CDc - CDt}{CDc} \times 100$$

Where,
CCE = *Cuscuta* control efficiency (per cent).
CDc = *Cuscuta* biomass (g m^{-2}) in control plot.
CDt= *Cuscuta* biomass (g m^{-2}) in treated plot.

***Cuscuta* index**

Cuscuta index was calculated as per procedure suggested by Gill and Kumar (1969).

$$CI = \frac{X - Y}{X} \times 100$$

Where,
X = Yield (kg ha^{-1}) from minimum *Cuscuta* competition plot.
Y = Yield (kg ha^{-1}) from the treatment plot for which CI is to be worked out.

Economic analysis

The economic analysis in terms of gross and net returns and benefit: cost ratio (returns per rupee invested) were made out based on the existing rate of inputs and output in the local market. Total variable cost included the cost of inputs such as seeds, fertilizers, irrigation and the cost for various cultural operations such as ploughing, sowing, weeding, harvesting, threshing, *etc.* Returns were calculated by using the following formulas.

Gross returns = Value of the seeds + Value of stover

Net returns = Gross returns - Total variable costs

$$\text{Benefit:Cost ratio} = \frac{\text{Gross returns}}{\text{Total variable cost}}$$

Crop productivity and profitability

Crop productivity and profitability was calculated on the basis of increase in yield and profit day^{-1} ha^{-1}. This was calculated by using the following formula as suggested by Kikraliya *et al.* (2025).

$$\text{Crop productivity (kg ha}^{-1}\text{ day}^{-1}\text{)} = \frac{\text{Grain yield (kg ha}^{-1}\text{)}}{\text{Duration of crop (day)}}$$

$$\text{Crop profitability (₹ ha}^{-1}\text{ day}^{-1}\text{)} = \frac{\text{Net return (₹ ha}^{-1}\text{)}}{\text{Duration of crop (day)}}$$

Statistical analysis

The data recorded for different parameters were analyzed with the help of the analysis of variance (ANOVA) technique for a randomized block design using MSTAT-C software. The results are presented at a 5% level of significance (p = 0.05).

RESULTS AND DISCUSSION

Growth parameters

The data on growth attributes of green gram (Table 1) indicated that the plant height at harvest stage differed under various chemical weed management options. The study revealed that the treatments significantly influenced the plant height of green gram. At harvest stage, taller (47.85 cm) plants were observed in weed free treatment which was followed by the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (44.87 cm). The shortest (17.89 cm) plants were observed unweeded control treatment without any weeding. The shortest height of the plant in unweeded control and PE application of pendimethalin @ 1.0 kg ha^{-1} is due the heavy infestation golden dodder. Among the treatments, weed free recorded the maximum number of branches per plant (5.34) which was statistically on par with the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (4.97) and rest of the treatment were significantly differs with each other and lowest was recorded with the unweeded control (2.15). This could be attributed to the use of ready-mix formulations of compatible herbicides with different modes of action, which can effectively reduce both weed density and weed dry weight of golden dodder. Similar kind of findings in green gram is in agreement with Udhaya *et al.* (2021) and Banerjee *et al.* (2018).

During the first 30 days after sowing, the leaf area index did not vary significantly with the exception of the weed-free treatment (0.69) which was statistically equal

Table 1: Growth attributes, yield attributes, protein content and grain yield of rice fallow green gram as influenced by chemical weed management practices during 2024 and 2025 (pooled mean).

Treatments	Plant height (cm) at harvest	No. of branches per plant at harvest	Leaf area index			SCMR 45 DAS	No. of pods per plant	100-seed weight (g)	Crude protein content (%)	Grain yield (kg ha^{-1})
			30 DAS	45 DAS	60 DAS					
T_1- PE application of pendimethalin @ 1.0 kg ha^{-1}	38.31	3.02	0.59	2.77	1.34	44.24	14.64	3.11	22.40	547.2
T_2- EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1}	44.87	4.97	0.54	2.95	1.50	46.65	24.87	3.36	22.81	710.5
T_3- EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1}	41.25	2.89	0.51	2.84	1.44	45.11	18.45	3.27	22.55	620.3
T_4- EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1}	43.12	3.21	0.47	2.91	1.47	45.68	19.52	3.29	22.60	627.1
T_5- Weed free	47.85	5.34	0.69	3.24	1.60	47.83	27.06	3.41	22.84	724.4
T_6- Unweeded control	17.89	2.15	0.29	1.90	0.89	40.24	7.23	3.03	20.85	195.0
SE±	0.71	0.21	0.01	0.03	0.11	0.38	0.26	0.05	0.09	9.43
CD (P=0.05)	1.94	0.49	0.017	0.101	0.323	1.12	0.851	NS	0.29	22.31

with PE application of pendimethalin 1.0 kg ha^{-1} (0.59), EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (0.54) and EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1} (0.51) and EPoE application of clodinafop propargyl 8% + fluazifop acifluorfen sodium 16.5% @ 185 g ha^{-1} (0.47) and the least (0.29) was recorded with unweeded control treatment (Table 1). The golden dodder weed is unique among weeds in that it takes around 6-8 days from seed to visible, tiny tendrils-like growth, parasitic attachment with host green gram plants and subsequent emergence. This explains why, with the exception of the unweeded control treatment, LAI is comparable at 30 DAS. Whereas, LAI at 45 DAS and 60 DAS the weed free treatment recorded significantly higher LAI (3.24 and 1.60) and it was followed by EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (2.95 and 1.50), EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1} (2.91 and 1.47), EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1} (2.84 and 1.44), PE application of pendimethalin 1.0 kg ha^{-1} (2.77 and 1.34) and the least (1.90 and 0.89) was recorded with unweeded control treatment.

The most crucial photosynthetic pigment for light absorption and electron transport in reaction centres is chlorophyll and SPAD reading provides a way to measure chlorophyll content in plants. The amount of chlorophyll in the leaves has a strong correlation with the SPAD value. At peak vegetative stage the significantly higher SCMR value (Table 1) was recorded in weed free treatment (47.83) and it was followed by the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (46.65). Comparatively, the treatments EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1} (45.11) and EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1} (45.68) are on par with each other. In contrast, the PE application of pendimethalin 1.0 kg ha^{-1} recorded lesser (44.24) and the least was recorded with the unweeded control treatment (40.24).

Yield parameters and yield

When comparing the number of pods produced per plant at maturity stage, the weed-free treatment had the highest number (27.06), followed by the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (24.87) while the remaining treatments performed poorly (Table 1). The unweeded control recorded the lowest pods per plant (7.23). The findings showed that weed control strategies did not have a significant impact on the weight of 100 seeds. Different methods of weed control resulted in noticeably different crude protein contents (Table 1). The crude protein content in the grains ranged from 20.85 to 22.85%. The weed-free treatment had considerably greater crude protein content (22.84%), compared to the other weed-management regimens. Following this, an EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (22.81%) which was comparable to an EPoE application of clodinafop

propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1} (22.60%) and an EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1} (22.55%). The unweeded control had the lowest crude protein level at 20.85%. The adoption of weed free condition recorded the higher grain yield (724.4 kg ha^{-1}) which was on par with the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (710.5 kg ha^{-1}). The least grain yield (195.0 kg ha^{-1}) was recorded with unweeded control. Similar outcomes were also reported by Vyvahare *et al.* (2023).

It is not necessary for the host plant to interact with the golden dodder seed for the seed to germinate. Being total shoot parasites, the plants rely on dicot hosts for sustenance and support following germination. A considerable decrease in biological yield occurs when seeds are permitted to grow for up to 30 days following emergence (Singh and Singh, 2020). Additionally, this strategy requires less labour and results in a 29.84% increase in yield than traditionally way of applying pendimethalin at a rate of 1.0 kg ha^{-1}, making it an economically viable method for optimizing green gram cultivation in rice fallow pulse agro-ecosystem. To top it all off, the expense of chemicals is less than that of laborious weeding. These findings align with previous research results (Marimuthu *et al.,* 2024). The study also highlights the significance of timing herbicide applications, especially on 25 DAS. The effectiveness of weed management measures in greengram and its yield can be greatly affected by the application of herbicides at critical stages of crop growth.

Weed parameters

At 30 DAS, the highest *Cuscuta* weed dry matter production (4.71 g m^{-2}) was observed in the unweeded control treatment, which was significantly higher than all other treatments. The remaining treatments also differed significantly from each other (Table 2). At 60 DAS, the highest weed dry matter production (14.56 g m^{-2}) was observed in unweeded control and the lowest (0.00 g m^{-2}) was recorded both weed free treatment as well as in EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1}. In our study dry matter of dodder are in agreement with Singh and Singh (2020). Weed free conditions significantly reduced weed biomass, which may be attributed to the smothering effect of green gram owing to coverage of ground surface and low light penetration. The competitive advantage of weeds over crops, leading to increased weed dry weight, can be attributed to the higher weed density in the weedy check. Similarly, the effectiveness of herbicidal chemical management of golden dodder was reported from a greenhouse study conducted in Andhra Pradesh, where the application of pronamide at 1.5 kg ha^{-1} was found to be effective in preventing the emergence of golden dodder throughout the crop growth period of green gram (Kumar, 1990). At 30 DAS, the highest *Cuscuta* control efficiency was observed for weed free treatment and the next best *Cuscuta* control efficiency (60.51%) was observed with EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (Table 2). Remaining treatments had *Cuscuta* control efficiencies ranging from 52.65 to 58.20%. Interestingly at 60 DAS a sharp increase in *Cuscuta* control efficiency (100%) was observed in EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} which was similar to weed free treatment. The next best *Cuscuta* control efficiency (96.91%) was observed with EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1} and the poor *Cuscuta* control efficiency were observed with unweeded control. Shilurenla *et al.* (2025) and Verma and Kushwaha (2020) also reported in their finding that hand weeding at 20 and 40 DAS showed the highest WCE. The lowest *Cuscuta* index was registered with weed free treatment and closely followed by EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (1.92%) (Table 2). While the remaining treatments *Cuscuta* index ranging from 13.43 to 24.46%. Similar results were reported by Singh *et al.* (2022).

The highest cost of cultivation and gross returns was recorded with weed free treatment (22000 ₹ ha^{-1} and 50035 ₹ ha^{-1}) and it was closely followed with EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (20008 ₹ ha^{-1} and 49104 ₹ ha^{-1}) and the lowest with unweeded control (17000 ₹ ha^{-1} and 13815 ₹ ha^{-1}) (Table 2). Surprisingly the higher benefit cost ratio was recorded with EPoE application of fluazifop–p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (2.45) and the lowest were recorded with the unweeded control (0.81). Among the weed control treatments evaluated, weed free treatment gave significantly higher crop productivity of 10.35 kg ha^{-1} day^{-1}, while and profitability of 373.9 ₹ ha^{-1} day^{-1} was registered with EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} (Table 2). Moreover both the weed free treatment and EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} were statistically on par with each other. The PE application of pendimethalin 1.0 kg ha^{-1} recorded the lower crop productivity of 7.817 kg ha^{-1} day^{-1} and profitability of 277.0 ₹ ha^{-1} day^{-1} among the chemical weed management options tried in the study. The lowest crop productivity of 2.786 kg ha^{-1} day^{-1} and profitability of -61.8 ₹ ha^{-1} day^{-1} was registered with the unweeded control treatment. Very few studies have been conducted on the management of golden dodder in India and abroad. Golden dodder seeds can germinate without any triggering mechanism from host plant interaction. However, after germination, the plants thrive only on dicot hosts, as they require nutrition and support from them, being total shoot parasites. In our study the early post emergence (EPoE) application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} on 25 DAS was highly effective in managing the golden dodder in green gram up to 60 DAS. To minimize the environmental risks associated with herbicide use and promote safer agricultural practices, it is advisable to substitute synthetic herbicides with biological alternatives that pose fewer negative effects on the environment (Bacmaga *et al.,* 2024).

Table 2: Dry matter production of *Cuscuta*, *Cuscuta* Control Efficiency, *Cuscuta* Index and economics of rice fallow green gram as influenced by chemical weed management practices during 2024 and 2025 (pooled mean).

Treatments	Dry matter production of *Cuscuta* (g m^{-2})		*Cuscuta* control efficiency (%)		*Cuscuta* index	Cost of cultivation	Gross return	BCR	Crop productivity	Crop profitability
	30 DAS	60 DAS	30 DAS	60 DAS	(%)	(₹ ha^{-1})	(₹ ha^{-1})		(kg ha^{-1} day^{-1})	(₹ ha^{-1} day^{-1})
T_1- PE application of pendimethalin @ 1.0 kg ha^{-1}	1.65(2.23)	3.01(8.56)	52.65	41.21	24.46	18913	38162	2.02	7.817	277.0
T_2- EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1}	1.54(1.86)	0.71(0.00)	60.51	100.0	1.92	20008	49104	2.45	10.15	373.9
T_3- EPoE application of propaquizafop 2.5% + imazethapyr 3.75% @ 125 g ha^{-1}	1.62(2.11)	1.75(2.56)	55.20	82.42	14.37	18725	43060	2.30	8.861	308.5
T_4- EPoE application of clodinafop propargyl 8% + acifluorfen sodium 16.5% @ 185 g ha^{-1}	1.56(1.94)	0.97(0.45)	58.81	96.91	13.43	18580	43516	2.34	8.959	316.9
T_5- Weed free	0.71(0.00)	0.71(0.00)	100.00	100.00	0.00	22000	50035	2.27	10.35	358.4
T_6- Unweeded control	2.28(4.71)	3.88(14.56)	0.00	0.00	73.08	17000	13815	0.81	2.786	-61.8
SE±	0.021	0.024							0.20	7.125
CD (P=0.05)	0.064	0.071							0.59	20.85

CONCLUSION

From the two years of field trials the results confirmed that the EPoE application of fluazifop-p-butyl 11.1% + fomesafen 11.1% @ 250 g ha^{-1} on 25 DAS in rice fallow pulse (green gram) agro-ecosystem for effective golden dodder management and sustaining the productivity and profitability.

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Conflict of interest

I would like to inform on behalf of all the authors that all the authors disclose that there is no potential conflict of interest related to the publication of the work.

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