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Evaluation of solar nipping tool in enhancing the efficiency and yield of chickpea

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Abstract
Chickpea is an important crop in the cropping pattern supplying cheap protein diet especially for poor people. The tender leaves are being consumed by the people in the form of a cooked vegetable. To improve the yield of chickpea, the tender leaves are nipped off after 45 days of sowing and this makes the plant bushy as it promotes the growth of lateral branches which helps to produce more pods and thus the yield. Front line demonstrations were carried out at Hadagali and Tajpur village, Vijayapur district, Karnataka to assess the effect of nipping technique in chickpea. A comparison was made between manual nipping and solar operated nipping cum foliage collector tool. It is concluded from the study that the drudgery of the farm women was reduced by using the solar nipping tool compared to manual nipping in nipping of chickpea. The nipping technique also enhanced the yield and net profit of the farmers.

Keywords: Evaluation, solar, enhancing, chickpea

Introduction
Chickpea is an important crop in the cropping pattern supplying cheap protein diet especially for poor people. The leaves are slightly sour in taste due to the presence of oxalic and malic acids. The tender leaves are being consumed by the people in the form of a cooked vegetable. Studies have shown that chickpea leaves are nutritious. They are a good source of both macronutrient minerals (calcium, magnesium, potassium, phosphorus) and micronutrient minerals (iron, zinc, manganese, copper and boron) and the levels of most of these minerals significantly exceed those reported for spinach and cabbage (Varshney, 2021). To improve the yield of chickpea, the tender leaves are nipped off after 45 days of sowing and this makes the plant bushy as it promotes the growth of lateral branches which helps to produce more pods and thus the yield. Research studies have concluded that nipping is a profitable practice for chickpea growers. Further nipping is being done by farm women either in sitting position or bending position. This is the most tedious job and hence new tools have been introduced to reduce the drudgery and enhance the work efficiency of farm women. The tool introduced is solar nipping tool.

Material and Methods
Front line demonstrations were carried out at Hadagali and Tajpur village, Vijayapur district, Karnataka to assess the effect of nipping technique in chickpea. A comparison was made between manual nipping and solar operated nipping cum foliage collector tool. The sample size comprised of thirty farm women. Quantity of nipping was calculated per hour. Percentage increase in yield, labour expenditure, time spent and drudgery involved was also calculated.

Results and Discussion
Drudgery can be defined by its time-consuming, repetitive and arduous nature. Farm women do the most tedious and back-breaking tasks in agriculture, animal husbandry and homes. Rural Indian women are extensively involved in agricultural activities. Besides being involved in household chores, they attend to arduous field operations like sowing, transplanting, weeding, interculturing, harvesting, threshing and agro-processing in crop production, fuel and fodder cutting, water fetching, cleaning of houses, cooking, child rearing, household maintenance and dairying/animal husbandry besides being busy in allied fields (Singh *et al*., 2007) [5]. Since all these operations are done manually, they cause considerable physical and mental fatigue and other health problems. The root cause of suffering of farm women is ignorance, age-old methods of doing work, inappropriateness of technology and attitudinal constraints such as innate conservation and resistance to change.

During these activities they adapt unnatural body posture due to which their physiological workload increases and also they face many types of musculoskeletal problems as a result, the efficiency of women to work decreases to a greater extent (Jyotsana *et al*., 2005). Further, a study by Aryal and Kattal (2019) [1] also suggests that the workload of women especially time and energy in the farming activities can be reduced in two ways namely making existing tasks easier or increasing the productivity of existing labor or changing farm practices with new technology. Changes in the existing practice or introduction of new technology often reduces the workload of women in terms of both time and energy. Hence, in this study, solar nipping tool was introduced to the farm women under front line demonstrations.

Table-1 reveals the comparison of the drudgery involved in nipping of chickpea between manual nipping and solar nipping tool.

Table 1: Drudgery parameters during nipping of chickpea

Particulars	Manual nipping	Solar operated nipping
Body position	Bending or sitting	Standing
Nipping	With fingers	With blades
Ease of nipping	Tedious	Easy
Time consumption	More	Less
Pain in knees	Yes	No
Pain in fingers	Yes	No
Burning to fingers	Yes	No

In manual nipping, the nipping is done in bending or sitting position with fingers which is a tedious process, the time consumption is more. There is pain in the knees and fingers and also there is burning sensation to the fingers. Whereas solar nipping is done in standing position and the tender leaves are nipped with the rotating blades using solar energy and hence there is no pain and burning to fingers. The time consumption for nipping is also too less. One acre of nipping the tender leaves of chickpea can be completed in three hours. A technical report by Singh *et al*. (2019) [6] also stated that while surveying the drudgery perceived by farm women in different parts of the body, it was found that majority of them faced very severe pain in spine (78%), shoulder (72%), wrist (61%), waist (44.8%) and knees (16.5%). It was concluded that the whole body felt difficulty while performing different works related to crop production, post- harvest handling and live stock activities. Another study by Choudhary (2017) also revealed that women farmers use traditional tools and implements since a long time and felt immense drudgery in their use. It was also found that most of the farmers were unaware of improved farm tools and implements which reduce drudgery. The results also suggested that the respondents were willing to use the improved tools and implements that reduce drudgery and occupational health problems of women in agriculture.

Further comparison of economics between manual nipping and solar operated nipping in chickpea is revealed in table-2.

Table 2: Comparison of economics in nipping of chickpea

Particulars	Manual nipping	Solar operated nipping	Percentage increase
Tender foliage nipped (Kg/ ha)	26	35.5	36.53
No. of pods/ plant	59.6	72.8	22.15
No. of branches/ plant	14.2	18.4	29.57
Average Yield (q/ha)	10.3	12.1	17.47
Gross cost (Rs./ha)	47380	55844	17.86
Gross return (Rs./ha)	22040	23060	4.62
Net return (Rs./ha)	25340	32784	29.37
B:C ratio	2.15	2.42	12.55
Labour cost (per ha)	2400	600	- 0.75
Time consumed (days/ha)	1.5	3	100

There is a percentage increase by 36.53 percent in tender foliage nipping in solar operated nipping compared to manual nipping. The number of pods per plant has increased by 22 percent, the number of branches per plant increased by 29.5 percent. The average yield in solar nipping technique increased by 17.47 percent and net profit by 29.37 per cent. There was an improvement in B: C ratio by 12.55 percent in solar nipping compared to manual nipping. Also there is a reduction in labour cost by 75 percent in solar nipping compared to manual nipping. The results of the study are in line with the results of the study carried out by Shubha, *et al*. (2021) [7] wherein higher gross and net returns with greater BC ratio was observed with nipping using solar operated tool followed by hand nipping technology. Another study by Patil (2012) [4] also supported the findings of the present study stating that the new technologies reduced the drudgery of farm women, increased their work efficiency, saved time, labour expenses and provided health security. The new technologies were found to be more efficient, labour saving, time saving, reduced drudgery and provided health security.

Conclusion

It is concluded from the study that the drudgery of the farm women was reduced by using the solar nipping tool compared to manual nipping in nipping of chickpea. The nipping technique also enhanced the yield and net profit of the farmers.

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