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Effect of Various Stages and Levels of Detopping on Growth, Fodder Yield and Quality of Detopped *Rabi* Maize (*Zea mays* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during *rabi* 2021-22 to study the effect of various stages and levels of detopping on growth parameters, fodder yield and quality parameters of detopped rabi maize at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka. The experiment was laid out in split plot design with three replications and comprising sixteen treatment combinations with one control. The main plot consisted of four stages of detopping

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(detopping at 15 days, 20 days, 25 days and 30 days after silking and 0sub plot consisted of four levels of detopping (detopping up to two, three, four and five leaves). The results revealed that, higher plant height (189.64 cm) was recorded when detopping was carried out at 30 days after silking with top two leaves and was followed by detopping at 15 days, 20 days and 25 days after silking with top two leaves. Whereas, higher number of green leaves (10.33) and leaf area index (4.55) were recorded when detopping was carried out 15 days after silking with two leaves and was followed by detopping at 15 days after silking with top three leaves. Detopping at 15 days after silking with top five leaves recorded higher detopped green (5821 kg ha^{-1}) and dry fodder yield (1537 kg ha^{-1}) and was on par with detopping at 20 days after silking with top five leaves. The control (no detopping) treatment recorded significantly higher plant height, number of green leaves, leaf area index and total dry matter production.

Keywords: Detopping; fodder; levels; silking; stages.

1. INTRODUCTION

Maize (*Zea mays* L.) is an annual short day cross pollinated plant and it is popularly known as Makka and is one of the important cereal crops. In India, it ranks third after rice and wheat. It is the most versatile crop with wider adaptability in varied agro-ecological regions. Maize has the highest genetic yield potential among food grain crops. Hence, it is called as “Queen of cereals”. Maize being photo-thermo-insensitive crop, therefore in India, it is cultivated throughout the year in most of the states. Among non-legume fodders, maize is good source of starch, neutral detergent fibre (38 to 41%), acid detergent fibre (23 to 25%), lipid (5% oils) and crude protein (8 to 10%). So it is considered as energy efficient crop for livestock’s.

Detopping refers to removal of terminal portion from the upper most node to improve the yield by arresting unnecessary growth, decreasing mutual shading of leaves, enhancing light interception, increasing nutrient uptake, decreasing competition between the tassel and cob for available plant nutrients, improve the source-sink relationship and better cob development. Detopping is necessary to get green fodder to animals in case of emergency without sacrificing the grain yield. It increases the green fodder availability which in turn increases the milk yield of animals. Farmer practices the detopping after brown husk without affecting the grain yield. If detopping really has no effect on the grain productivity, it may become the one of the most economical ways of increasing the yield. Besides, the additional advantages of controlling lodging in case of excessive vegetative growth and providing green fodder to animals without sacrificing the grain yield. Proper time of detopping seems to be very important for optimum grain yield of maize [1]. Since feeds of animal alone account for more than half of the overall cost of animal production. However the livestock business success depends primarily on the quality forage availability in any given country and it is the only method to decrease cost and maximize profits. Hence in some parts of northern Karnataka, some of farmers practice the detopping to produce a lot of green fodder during fodder scarcity. The research work on effect of detopping in *rabi* maize crop is very meager. Hence, the experiment was initiated to study the effect of various stages and levels of detopping on growth parameters, fodder yield and quality parameters of detopped *rabi* maize.

2. MATERIALS AND METHODS

A field experiment was conducted during *rabi* 2021-22 at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka. The farm is geographically situated at 15^{o} 26’ N latitude, 75^{o} 07’ E longitude and at an altitude of 678 m above the mean sea level. The experiment was laid out in split plot design with three replications and comprising sixteen treatment combinations with one control (no detopping). The main plot consisted of four stages of detopping (detopping at 15 days, 20 days, 25 days and 30 days after silking and sub plot consisted of four levels of detopping (detopping up to two, three, four and five leaves). Maize seeds (NK-6240 Plus) were sown in the field with plot size of 5.40 m x 4.00 m with spacing 60 cm x 20 cm on 1st December, 2021. The soil type of the experimental site was medium black (*vertisols*) and clayey in texture. The soil was alkaline in reaction (7.74) with normal electrical conductivity (0.39 dS m^{-1}), low in organic carbon content (0.49 %), medium in available nitrogen (290.80 kg ha^{-1}), phosphorous (28.30 kg ha^{-1}) and high in available potassium (331.40 kg ha^{-1}). Fertilizer was applied on the

basis of recommended doses (150:65:65 kg N, P_2O_5, K_2O kg $ha^{-1}$and 25 kg $ZnSO_4$ and $FeSO_4$ each ha^{-1}). The silking commenced at 67 DAS and treatments were implemented at 15 days interval after silking. Herbicide and pesticides were used to control the weeds and pests respectively. Every 12-15 days interval, irrigation was given based on soil moisture content. The experimental data recorded at harvest was complied and subjected to statistical analysis by adopting Fischer's method of analysis of variance technique as outlined by Gomez and Gomez [2]. The level of significance used in 'F' test was at 5 per cent.

3. RESULTS AND DISCUSSION

3.1 Effect on Plant Height, Number of Green Leaves and Leaf Area Index Total Dry Matter Production of *Rabi maize*

The results revealed that detopping at various stages was found non-significant on plant height, number of green leaves and leaf area index (Table 1). However numerically, the higher plant height (167.67 cm) was recorded when detopping was done at 30 days after silking and was on par with detopping at 25 days after silking (167.42 cm). Whereas, higher number of green leaves (9.02) and leaf area index (4.24) were recorded when detopping was done at 15 days after silking and was followed by detopping at 20 days after silking (8.10 and 3.84 number of green leaves and leaf area index, respectively). Among Different levels of detopping had a significant effect on plant height, number of green leaves $plant^{-1}$, leaf area index and total dry matter production. Significant higher plant height (189.32 cm), number of green leaves $plant^{-1}$ (8.80), leaf area index (3.85) and total dry matter production (209.17 g $plant^{-1}$) were recorded when detopping was done up to two leaves than detopping up to five leaves. The Detopping up to five leaves had recorded significant lowest value in all these parameters. However, the interaction effect due to various stages and levels of detopping was found significant on plant height, number of green leaves, leaf area index, total dry matter production, green fodder and dry fodder yield after detopping. The higher plant height (189.64 cm) and total dry matter production (232.65 g $plant^{-1}$) were recorded significantly higher when detopping was done at 30 days after silking with top two leaves. A significant increased plant height was due to optimum availability and supply of soil moisture which helped in better uptake of nutrients and synthesis of amino acids in the vegetative meristematic tissue, which ultimately enhanced cell division, elongation and there by resulted in higher plant height. Delay in detopping decreased trend was noticed in case of growth parameters except plant height and total dry matter production. Different types of leaf clipping have various influences on dry matter accumulation when it was followed at the primary stage of grain development [3]. The total dry matter production is an important determinant of economic yield. Though LAI reduced with number of leaves removal, but dry matter production was not affected significantly with detopping up to two leaves, this may be due to proper absorption of sun light from the top leaves. These results are in conformity with findings of Manju Bhargavi et al. [4] and Bhargavi et al. [1]. Whereas, higher number of green leaves (10.33) and leaf area index (4.55) were recorded significantly higher when detopping was done at 15 days after silking with top two leaves and was followed by detopping at 15 days after silking with three leaves (9.93 and 4.40 number of green leaves and leaf area index, respectively). This might be due to more number of green leaves and no senescence of lower leaves at early reproductive stage.

3.2 Effect on Detopped Green and Dry Fodder Yield of *Rabi maize*

The growth parameters are known to influence the fodder yield in crops. Green fodder is an economical source of nutrients for the dairy animals and is highly digestible and palatable. The demand of growing livestock population is met by producing higher green fodder yield. Maize was being one of the most popular dual purpose crop grown widely for both grain as well as fodder. The present investigation focuses on the effect of various stages and levels of detopping. It had a significant effect on detopped green and dry fodder yields (Table 2). However, detopping at 15 days after silking with top five leaves recorded significantly higher detopped green (5821 kg ha^{-1}) and dry fodder yields (1537 kg ha^{-1}). The increase in green and dry fodder yields were to an extent of 63.59 per cent and 42.94 per cent respectively over detopping at 15 days after silking with top two leaves. However, it was on par with detopping at 20 days after silking with top five leaves. The increase in fodder yield might be due to detopping at early reproductive

Table 1. Plant height, number of green leaves and leaf area index of *rabi* maize as influenced by various stages and levels of detopping

Treatment	Plant height (cm) after detopping					Number of green leaves per plant after detopping					Leaf area index after detopping				
L ↓ S →	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
L_1	188.84^{b}	189.3^{b}	189.49^{b}	189.64^{b}	189.32^{a}	10.33^{b}	9.4^{d}	8.67^{e}	6.80^{h}	8.80^{a}	4.55^{b}	4.06^{c}	3.86^{d}	2.94^{g}	3.85^{a}
L_2	174.21^{c}	174.47^{c}	174.68^{c}	174.83^{c}	174.55^{b}	9.93^{c}	8.53^{e}	7.40^{g}	5.93^{i}	7.95^{b}	4.40^{b}	4.03^{c}	3.51^{e}	2.71^{h}	3.67^{b}
L_3	159.21^{e}	159.45^{de}	159.77^{de}	160.03^{d}	159.62^{c}	8.53^{e}	7.73^{f}	6.60^{h}	4.47^{k}	6.83^{c}	4.16^{c}	3.76^{d}	3.24^{f}	2.19^{i}	3.34^{c}
L_4	145.34^{f}	145.51^{f}	145.73^{f}	146.18^{f}	145.69^{d}	7.27^{g}	6.73^{h}	5.40^{j}	3.47^{l}	5.72^{d}	3.84^{d}	3.52^{e}	2.81^{gh}	1.84^{j}	3.00^{d}
Mean	166.90^{a}	167.18^{a}	167.42^{a}	167.67^{a}		9.02^{a}	8.10^{b}	7.02^{c}	5.17^{d}		4.24^{a}	3.84^{b}	3.36^{c}	2.42^{d}	
Control	205.25^{a}					10.77^{a}					4.72^{a}				
	S.Em. ±					**S.Em. ±**					**S.Em. ±**				
S	0.23					0.19					0.08				
L	0.17					0.07					0.04				
S× L	0.35					0.14					0.08				
Control	0.40					0.26					0.10				

Means followed by the same letter (s) within a column are not significantly differed by DMRT (p= 0.05)
NS: Non significant
DAS: Days After Sowing

Main plot : Stages of detopping after silking (S)
S_1 : Detopping at 15 days after silking
S_2 : Detopping at 20 days after silking
S_3 : Detopping at 25 days after silking
S_4 : Detopping at 30 days after silking
***Control** : No detopping*

Sub plot : Levels of detopping (L)
L_1 : Detopping up to two leaves
L_2 : Detopping up to three leaves
L_3 : Detopping up to four leaves
L_4 : Detopping up to five leaves

Table 2. Total dry matter production, detopped green and dry fodder yield of *rabi* maize as influenced by various stages and levels of detopping

Treatment	Total dry matter production (g plant^{-1}) after detopping					Detopped green fodder yield (kg ha^{-1})					Detopped dry fodder yield (kg ha^{-1})				
L ↓ S →	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
L_1	185.38^{m}	201.45^{i}	217.22^{e}	232.65^{b}	209.17^{a}	2119^{fg}	1887^{g}	1896^{g}	1629^{g}	1883^{d}	877^{f}	854^{f}	834^{f}	816^{f}	845^{d}
L_2	179.41^{o}	193.49^{k}	208.76^{g}	225.20^{c}	201.71^{b}	3115^{d}	2850de	2655^{d-f}	2450^{ef}	2767^{c}	1050^{d}	1019de	987de	958^{e}	1004^{c}
L_3	172.58^{p}	188.52^{l}	203.44^{h}	219.33^{d}	195.97^{c}	4424^{c}	4233^{c}	4119^{c}	3883^{c}	4165^{b}	1258^{c}	1230^{c}	1204^{c}	1182^{c}	1218^{b}
L_4	167.40^{q}	182.49^{n}	198.67^{j}	213.75^{f}	190.58^{d}	5821^{a}	5366^{ab}	5176^{b}	4969^{b}	5333^{a}	1537^{a}	1498^{ab}	1463^{ab}	1433^{b}	1483^{a}
Mean	176.19^{d}	191.49^{c}	207.03^{b}	222.73^{a}		3870^{a}	3584^{a}	3461^{a}	3233^{a}		1180^{a}	1150^{ab}	1122^{ab}	1097^{b}	
Control	234.8^{a}					----					----				
	S.Em. ±					S.Em. ±					S.Em. ±				
S	0.14					169					13				
L	0.11					126					18				
S× L	0.22					251					36				
Control	0.63					263					34				

Means followed by the same letter (s) within a column are not significantly differed by DMRT (p= 0.05)
NS: Non significant
DAS: Days After Sowing

Main plot : Stages of detopping after silking (S)
S_1 : Detopping at 15 days after silking
S_2 : Detopping at 20 days after silking
S_3 : Detopping at 25 days after silking
S_4 : Detopping at 30 days after silking
***Control** : No detopping*

Sub plot : Levels of detopping (L)
L_1 : Detopping up to two leaves
L_2 : Detopping up to three leaves
L_3 : Detopping up to four leaves
L_4 : Detopping up to five leaves

Table 3. Detopped crude protein content and crude protein yield of *rabi* maize as influenced by various stages and levels of detopping

Treatment	Detopped crude protein content (%)					Detopped crude protein yield (kg ha^{-1})				
L ↓ S →	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
L_1	8.61^{a}	8.60^{a}	8.41^{ab}	8.38^{ab}	8.50^{a}	75.57^{ij}	68.49^{j}	83.73^{gh}	68.39^{j}	70.65^{d}
L_2	8.60^{a}	8.58^{ab}	8.48^{ab}	8.31^{ab}	8.49^{a}	90.31^{g}	87.36^{g}	102.32^{ef}	79.71^{hi}	85.28^{c}
L_3	8.64^{a}	8.63^{a}	8.50^{ab}	8.30^{ab}	8.52^{a}	108.74^{e}	106.21^{e}	124.79^{cd}	98.05^{f}	103.83^{b}
L_4	8.64^{a}	8.60^{a}	8.53^{ab}	8.44^{ab}	8.55^{a}	132.81^{b}	128.81^{bc}	83.73^{gh}	120.93^{d}	126.84^{a}
Mean	8.63^{a}	8.60^{a}	8.48^{a}	8.36^{a}		101.86^{a}	97.72^{ab}	95.25^{ab}	91.77^{b}	
Control	8.19^{b}					649.68^{a}				
	S.Em. ±					S.Em. ±				
S	0.11					1.54				
L	0.08					1.72				
S× L	0.15					3.44				
Control	0.16					3.92				

Means followed by the same letter (s) within a column are not significantly differed by DMRT (p= 0.05)
NS: Non significant
DAS: Days After Sowing.

Main plot : Stages of detopping after silking (S)
S_1 : Detopping at 15 days after silking
S_2 : Detopping at 20 days after silking
S_3 : Detopping at 25 days after silking
S_4 : Detopping at 30 days after silking
***Control** : No detopping*

Sub plot : Levels of detopping (L)
L_1 : Detopping up to two leaves
L_2 : Detopping up to three leaves
L_3 : Detopping up to four leaves
L_4 : Detopping up to five leaves

Table 4. Detopped total ash content and total ash yield of *rabi* maize as influenced by various stages and levels of detopping

Treatment	Detopped total ash content (%)					Detopped total ash yield (kg ha^{-1})				
L ↓ S →	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
L_1	7.24^{ab}	7.24^{ab}	7.23^{ab}	7.26^{ab}	7.24^{a}	63.48^{g}	57.40^{g}	60.25^{g}	59.18^{g}	60.08^{d}
L_2	7.18^{b}	7.23^{ab}	7.21^{ab}	7.24^{ab}	7.22^{a}	75.39^{e}	73.69^{ef}	71.13^{ef}	69.41^{f}	72.41^{c}
L_3	7.20^{ab}	7.25^{ab}	7.27^{a}	7.28^{a}	7.25^{a}	90.50^{d}	89.16^{d}	87.49^{d}	86.03^{d}	88.29^{b}
L_4	7.26^{ab}	7.24^{ab}	7.23^{ab}	7.23^{ab}	7.24^{a}	111.55^{b}	108.39^{bc}	105.70^{c}	103.59^{c}	107.31^{a}
Mean	7.22^{a}	7.24^{a}	7.23^{a}	7.25^{a}		85.23^{a}	82.16^{ab}	81.15^{ab}	79.55^{b}	
Control	7.22^{ab}					572.23^{a}				
	S.Em. ±					S.Em. ±				
S	0.02					0.99				
L	0.02					1.27				
S× L	0.03					2.54				
Control	0.03					2.44				

Means followed by the same letter (s) within a column are not significantly differed by DMRT (p= 0.05)
NS: Non significant
DAS: Days After Sowing

Main plot : Stages of detopping after silking (S)
S_1 : Detopping at 15 days after silking
S_2 : Detopping at 20 days after silking
S_3 : Detopping at 25 days after silking
S_4 : Detopping at 30 days after silking
***Control** : No detopping*

Sub plot : Levels of detopping (L)
L_1 : Detopping up to two leaves
L_2 : Detopping up to three leaves
L_3 : Detopping up to four leaves
L_4 : Detopping up to five leaves

Table 5. Detopped crude fibre content and crude fibre yield of *rabi* maize as influenced by various stages and levels of detopping

Treatment	Detopped crude fibre content (%)					Detopped crude fibre yield (kg ha^{-1})				
L ↓ S →	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
L_1	30.30^{h}	32.15^{e-g}	33.12^{de}	34.42^{bc}	32.50^{a}	326.65^{d}	255.01^{e}	276.14^{e}	280.68^{e}	269.49^{d}
L_2	31.14^{gh}	32.32^{ef}	33.67^{cd}	34.24^{bc}	33.06^{a}	392.78^{c}	338.31^{d}	332.30^{d}	328.06^{d}	331.33^{c}
L_3	31.23^{gh}	31.92^{fg}	33.90^{b-d}	34.53^{bc}	32.90^{a}	481.42^{b}	392.65^{c}	408.14^{c}	408.09^{c}	400.42^{b}
L_4	31.33^{f-h}	31.53^{fg}	34.06^{b-d}	34.72^{b}	32.91^{a}	326.65^{d}	472.20^{b}	498.19^{b}	497.49^{b}	487.33^{a}
Mean	31.00^{d}	32.20^{c}	33.69^{b}	34.48^{a}		366.75^{a}	364.54^{a}	378.69^{a}	378.58^{a}	
Control	36.10^{a}					2862.75^{a}				
	S.Em. ±					S.Em. ±				
S	0.11					4.80				
L	0.22					6.09				
S× L	0.43					12.18				
Control	0.39					13.33				

Means followed by the same letter (s) within a column are not significantly differed by DMRT (p= 0.05)
NS: Non significant
DAS: Days after Sowing

Main plot : Stages of detopping after silking (S)
S_1 : Detopping at 15 days after silking
S_2 : Detopping at 20 days after silking
S_3 : Detopping at 25 days after silking
S_4 : Detopping at 30 days after silking
***Control** : No detopping*

Sub plot : Levels of detopping (L)
L_1 : Detopping up to two leaves
L_2 : Detopping up to three leaves
L_3 : Detopping up to four leaves
L_4 : Detopping up to five leaves

phase with removal of more number of green and fresh leaves. Besides, the leaves might have contributed much for the production and translocation of photosynthates at the early reproductive phase. This may also be due to increased leaf to stem ratio, leaf area and leaf area index. These results are in conformity with the findings of Gaurkar and Bharad [5]. However, the maximum fodder yield was obtained when plants were detopped by leaving only one or two leaves above the cob. These results are in conformity with the findings of Roy and Biswas [6], Emran et al. [7] and Emam and Tadayon [8]. Whereas the lowest detopped green (1629 kg ha^{-1}) and dry fodder yields (816 kg ha^{-1}) were recorded when detopping was carried out at 30 days after silking with top two leaves. This may be due to lower number of leaves, dry matter production and reduced plant moisture content towards physiological maturity.

3.3 Effect on Crude Protein Content, Crude Protein Yield, Total Ash Content, Total Ash Yield, Crude Fibre Content and Crude Fibre Yield of *Rabi maize*

Various stages, levels and their interaction effects of detopping had a significant effect on detopped crude protein yield (Table 3). Significantly higher detopped crude protein yield (132.81 kg $ha^{-1)}$ was recorded when detopping was carried out at 15 days after silking with top five leaves and was on par with detopping at 20 days after silking with top five leaves. This was mainly due to higher detopped crude protein content and detopped dry fodder yield (Tables 3 & 2). Similar results were reported by Mahdi and Hasan [9] and Chaudhary [10]. Vinita [11] reported that zinc and iron act as catalysts in various growth processes and in hormone production as well as in protein synthesis, which increased the accumulation of photosynthates, this might be the reason for higher leaf weight. Similar observations were reported by Chaudhary [10]. Similarly, various stages, levels and their interaction effect were found non significant on detopped crude protein content of *rabi* maize (Table 3). Numerically higher detopped crude protein content (8.64 %) was recorded when detopping was carried out at 15 days after silking with detopping of top four leaves. These results are in accordance with findings of Fasae et al. [12] and Norton [13]. Aslam et al. [14] reported that, crude protein content of fodder was increased with increasing nitrogen content of maize (SPAD value) and Kumar et al. [15] recorded higher crude protein content of J-1006 might be due to its higher leaf growth and leaf to stem ratio as compared to African Tall, which in turn resulted in higher uptake of nitrogen and ultimately leads to higher crude protein content of fodder.

Further, in fodder crop, ash represents the mineral content of plant. Various stages, levels and their interaction effects were found significant on detopped total ash yield of rabi maize (Table 4). Significantly higher detopped total ash yield was recorded when detopping was done at 15 days after silking with top five leaves and was on par with 20 days after silking in combination with detopping up to five leaves. This was mainly due to higher detopped total ash content and detopped dry fodder yield (Table 4 and 2). Similar results were reported by Mahdi and Hasan [9] and Chaudhary [10].

Similarly, various stages, levels and their interaction effects were found non-significant on detopped total ash content of rabi maize (Table 4). Numerically higher detopped total ash content (7.28 %) was recorded when detopping was done at 30 days after silking with top four leaves. Similarly, fiber content is an important parameter to determine the quality of fodder. The fodder having less crude fiber per cent is considered as good quality fodder. Higher crude fiber content results in lower digestibility of fodder. Various stages of detopping were found non-significant on detopped crude fibre yield. But levels of detopping and interaction effect had a significant effect on crude fibre yield (Table 5). The higher detopped crude fibre yield (498.19 kg ha^{-1}) was recorded when detopping was done at 25 days after silking with top five leaves and was on par with detopping at 30 days after silking with top five leaves. This was mainly because of higher detopped crude fibre content and detopped dry fodder yield. Similarly, various stages and levels of detopping was found non significant on detopped crude fibre content of rabi maize (Table 5). The interaction effect of various stages and levels of detopping had a significant effect on detopped crude fibre content. The higher detopped crude fibre content (34.72%) was recorded when detopping was done at 30 days after silking with top five leaves and was on par with detopping at 25 days after silking with top four and five leaves and detopping at 30 days after silking with top two, three and four leaves. Crude fiber content increased with plant growth and maturity. The increase in detopped crude fibre content was mainly due to delay in detopping. Maximum fibre fraction was recorded

when detopping was done at 30 days after silking, this represents that as the age of crop advances most of the photosynthates will transfer for development of grains with increased pectin, cellulose, hemicelluloses and lignin content, which are major constituents of fibre fraction. Jayesh Shesh et al. [16] reported that increased dry matter accumulation during late maturity stage might have encouraged the growth of fibre. Whereas, the lowest crude fibre content (30.30 %) was recorded when detopping was done at 15 days after silking with top two leaves. This might be due to detopping at early reproductive phase which enhanced higher plant moisture content. Hanif and Akhtar [17] reported that fibre content decreases with higher moisture content in autumn season, as harvesting time was at low temperature duration. It had high fibre content in spring season due to high temperature and low humidity in the environment.

4. CONCLUSION

The detopping at 15 days after silking in combination with detopping up to five leaves was found significantly higher Plant height (cm), Number of green leaves per plant, Leaf area index, total dry matter production (g plant^{-1}), detopped green fodder yield (kg ha^{-1}), detopped dry fodder yield (kg ha^{-1}), detopped crude protein content (%), detopped crude protein yield (kg ha^{-1}), detopped crude fibre content (%) and detopped crude fibre yield (kg ha^{-1}) over other treatment combinations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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