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Effect of Silage Prepared from *Parthenium hysterophorous* (Congress grass) and *Cannabis sps*. (Hemp) with Maize on Blood Biochemistry of Goats

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A B S T R A C T

The present study evaluated the silage prepared from Parthenium- Cannabis-Maize mix (30:8:60 + 2 molasses) (PCM) and its utilization by goats. Twelve non-descript local adults male goats was randomly divided into two equal groups as per randomized block design and were fed either maize silage or PCM silage *ad libitum* supplemented with concentrate mixture @ 20g/KgW$^{0.75}$. The feeding trial was of 30 days duration along with a digestion-cum-metabolism trial during last week of the feeding trial. Final pH of the MS and PCM silage was 5.72 and 5.60, respectively. Mean concentration of NH_3-N (as percentage of total N) was significantly higher in MS silage. The haemoglobin levels, serum protein profile, blood urea nitrogen and AST, ALT levels were comparable among two dietary treatments. It was concluded that *Parthenium hysterophorus* and *Cannabis sps*. are poor substrate for ensiling and their intake and fiber digestibility was lower than conventional silage. Nevertheless, ensiling seems to be excellent method for containment of *Parthenium hysterophorus* and *Cannabis sps.*

Introduction

Parthenium hysterophorous (Congress grass) is an obnoxious weed (Khaket *et al.,* 2015), that has spread rapidly and extensively throughout the world since the 1970s (Evans, 1997) and is considered as one of the World's seven most damaging weeds (Ghosh *et al.,* 2012 and Kushwaha and Maurya, 2012). It was accidentally introduced into India as a contaminant in PL 480 wheat imported from United States of America in 1950s (Singh *et al.,* 2008) and is now estimated to occupy more than 5 million hectares of land in the India (Kumar and Kumar, 2010). It is a cause of concern for agriculturists, livestock farmers, town planners etc. The toxic effects of parthenium are exerted as contact dermatitis and air borne dermatitis, fever and asthma. The primary active ingredient responsible for toxic effects is a sesquiterpene lactone-parthenin. It was shown to be responsible for chronic as well as acute toxicity in livestock.As a weed, parthenium is nutrient aggregator and is therefore rich in nutrients (Bhoyar *et al.,* 2018) which indicate that parthenium herbage in its unprocessed fresh form can be extremely toxic to livestock.

However Hemp (*Cannabis sps*.) is another infamous plant that has invaded vast land area in India including Jammu. It is one of the

oldest and fastest growing plants known to man (Nelson, 2000). Despite its many uses (fibre, oil, medicine, food), its cultivation is restricted. Its growth in public places and wasteland leads to its undesirable use as a hallucinogen due to the presence of tetrahydrocannabinol (THC), a psychotropic chemical (Febles, 2018).The cultivation of *Cannabis sps.* is highly regulated by the government through law (Butsic and Brenner, 2016).Wasteland invasion by this plant makes such regulatory provisions ineffective and therefore its containment as a weed is desirable. Their management is a difficult task due to high proliferation rate and ecological adaptability (Saini *et al.,* 2014). Large scale utilization of weeds can be an attractive alternative to economically signify as well as manage hazardous weeds (APFISN, 2007; Javaid and Shahfique, 2010). Capability of weed to function as a source of feed additive, and animal feed after ensilage opens more directions for utilization of these weed (Saini *et al.,* 2014).

Materials and Methods

The study was conducted during the months of September-January at R S Pura, Jammu. Maize fodder was procured from a farmer's field near Domana, Jammu. The harvesting was done near milk stage. Concurrently, whole plants of parthenium (*Parthenium hysterophorus*) and hemp (*Cannabis sp.*) were collected from the premises of SKUAST-J, RS Pura, Jammu. The samples of all three plants were analyzed for chemical composition (proximate analysis, fiber fractionation, calcium and phosphorus content).All the collected plants were chopped separately into 2-3 cms long pieces using a electric motor driven chaff cutter. Ensiling was done in multiple large polythene bags of approximately 50 kg capacity each. Silage was prepared from the Maize fodder which serves as a control silage (MS). Based on the chemical coposition of the plant samples (Table 1), a combination of Parthenium (30%), Cannabis (8%) and Maize (60%) along with 2% molasses (all fresh weight basis) were mixed together and ensiled to serve as Treatment silage (PCM). The polythene bags were filled with respective material to be ensiled, hand pressed and closed tightly using a string. Further, the string tied bags were also sealed Mud pack. The sealed bags were stored in godown in shade on a raised platform in shade. Silo bags were allowed 90 days incubation period. Bags were opened one at a time after incubation period for the purpose of feeding trial. Along with ensiling for feeding trial in silo bags, a laboratory level ensiling of MS and PCM were also done in multiple replicates from same lot of chopped plant material. This ensiling was done in 500 gms capacity zip lock polythene bags. The pH content of ensiled material was estimated at the start of incubation period and then at fortnightly intervals. Twelve local, non-descript, adult male goats (10-14 months age; 28.90±1.64 kg live weight) were randomly allotted to two equal groups (n=6 per group) namely, MS and PCM as per randomized block design. All the experimental goats were kept under uniform management conditions with the provision of individually feeding in well ventilated cement floored sheds. The goats were treated for ecto- and endo-parasites with Butox$^{(R)}$ spray and Panacur$^{(R)}$ bolus, respectively before the start of study. Clean, wholesome drinking water was provided twice daily on *ad libitum* basis.All the experimental goats were managed on *ad libitum* silage supplemented with concentrate mixture @ 20g/KgW$^{0.75}$ feeding regimen. The MS group was offered maize silage and PCM group was kept on Parthenium-Cannabis-Maize silage prepared as per sub-section 3.3. Both the groups were supplemented with concentrate mixture of similar composition (Maize-25%, Mustard oil cake-37%, Wheat bran-35%, Mineral ixture-2% and common salt-1%). The

concentrate mixture was formulated to satisfy the nutrient requirements of goats as per ICAR (2013). The blood was collected from all the goats at the start of the experiment and then at 10 days intervals for analysis of haematological parameters and serum biochemistry. Blood from experimental goats was collected early in the morning before feeding, by jugular vein puncture. About 10 ml of whole blood was collected from every animal, from that 2 ml was added with EDTA, for hematological parameters study. The data obtained from chemical analysis of feedstuffs and metabolism trial was subjected to one-way ANOVA, whereas observations of daily dry matter intake, body weight and blood parameters was subjected to multivariate analysis (Snedecor and Cochran, 1994). The means bearing significant difference were ranked by Duncan's multiple range test as per Duncan (1955).

Results and Discussion

The chemical composition details of the analysed feedstuffs are presented in table 1. The *P. hysterophorous* whole plant was found to contain 87.14% OM, 37.68% CP, 34.11% NDF, 26.14% ADF, 0.54% calcium and 0.46% phosphorus, whereas *Cannabis sps.* contained 82.45% OM, 28.13% CP, 44.12% NDF, 19.00% ADF, 0.46% calcium and 0.48% phosphorus. The proximate composition and fiber fractions of parthenium and *Cannabis sps.*, Maize silage (MS) and Parthenium-Cannabis-Maize (PCM) silage, and concentrate mixture used in the study are presented in Table 1. The DM, CP and CF contents of MS are 38.67, 13.22, and 43.19 per cent, respectively, while, that of PCM silage are 24.63, 17.49 and 47.14 per cent, respectively. The NDF and ADF content of the silages was 37.14 and 35.17 per cent, respectively for MS, while that of PCM silage was 21.07 and 40.09, respectively. The MS and PCM silages differed significantly ($P<0.01$) for all analysed parameters, except per cent OM and calcium and phosphorus content ($P>0.05$).The concentrate mixture fed to experimental goats in feeding trial contained 92.39±0.98% OM, 23.37±0.24% CP, 44.35±0.14% NDF and 12.40±0.14% ADF. The calcium and phosphorus content of the concentrate mixture was 0.94±0.01 and 0.52±0.01 per cent, respectively. Fortnightly state of fermentation evaluated as pH and NH_3-N (ammonia nitrogen) concentration for MS and PCM silages used in feeding trial is presented in table 2 and figure 1. Final pH of the MS and PCM silage was 5.72 and 5.60, respectively. There was significant difference ($P<0.01$) between treatments and between periods. The mean pH decreased from 7.04±0.02 at the start of ensiling to significantly lower ($P<0.01$) pH with each fortnight. Further, there was significant treatment and period interaction ($P<0.01$).The NH_3-N concentration was expressed as percentage of total N concentration in the silage. The mean concentration of NH_3-N in PCM silage (8.49±0.78) was significantly higher than that in MS silage (5.13±0.44). There was significant increase ($P<0.01$) in NH_3-N concentration after a month of ensiling (between 30^{th} and 45^{th} day observation) followed by steady increase till the end of incubation period (90^{th} day). Significant ($P<0.01$) treatment and period interaction was also observed. The effect of feeding MS silage as compared to PCM silage to experimental goats on levels of blood bio-chemicals and serum enzymes measured at the start of experiment and at 10-day interval thereafter is presented in table 3 and 4. The mean Hb level varied from 9.11 to 11.38 g/dl in MS fed group, whereas in PCM fed group it varied between 9.32 to 11.06 g/dl. There was significant ($P<0.01$) periodic difference in mean haemoglobin level of experimental goats, however, the values were comparable ($P>0.05$) among two dietary treatments.

Table.1 Chemical composition (%)[#] of the weed samples, silages and concentrate mixture used in feeding-cum-metabolism trial

Attributes^	Weed samples		Silage as per Treatments*				Concentrate mixture
	Parthenium hysterophorous	*Cannabis sps.*	MS	PCM	SEM	P value	
Dry Matter	24.38	40.94	38.67	24.63	3.15	0.000	92.24±1.02
Organic matter	87.14	82.45	86.09	86.24	0.04	0.062	92.39±0.98
Crude Protein	37.68	28.13	13.22	17.49	0.96	0.000	23.37±0.24
Ether extract	6.52	7.51	6.03	7.51	0.34	0.000	7.50±0.07
Crude fibre	41.42	44.29	43.19	47.14	0.91	0.001	4.54±0.15
Nitrogen free extract	1.52	2.51	23.64	14.1	2.16	0.000	57.21±1.09
Neutral detergent fibre	34.11	44.12	37.14	21.07	3.59	0.000	44.35±0.14
Acid detergent fibre	26.14	19.00	35.17	40.09	1.11	0.000	12.40±0.14
Calcium	0.54	0.46	0.26	0.25	0.001	0.453	0.94±0.01
Phosphorous	0.46	0.48	0.48	0.47	0.001	0.169	0.52±0.01

[#]Each value is a mean of 3 observations
*MS: Maize silage; PCM: Parthenium-Cannabis-Maize silage (30:8:60+ 2 Molasses)
^All values are on dry matter basis except dry matter

Table.2 Periodic rate of fermentation assay for silages used in feeding trial

Attribute/ Treatments*	Days since filling of silo bags							Treatment Mean± SEM	P value[#]		
	0	15	30	45	60	75	90		T	P	T x P
pH											
MS	7.08	6.62	6.24	6.08	5.81	5.79	5.72	6.19±0.10			
PCM	6.99	6.78	6.70	6.58	6.11	6.05	5.60	6.40±0.10			
Period mean ±SEM	7.04±0.02^{f}	6.70±0.04^{e}	6.47±0.11^{d}	6.33±0.11^{c}	5.96±0.07^{b}	5.92±0.06^{b}	5.66±0.03^{a}	6.30±0.07	0.000	0.000	0.000
NH_3-N (% of total N)											
MS	2.57	3.85	3.85	5.13	6.42	6.42	7.70	5.13±0.44			
PCM	7.62	4.57	4.57	13.71	9.14	7.62	12.19	8.49±0.78			
Period mean ±SEM	5.09±1.24^{a}	4.21±0.54^{a}	4.21±0.42^{a}	9.42±1.99^{c}	7.78±0.80^{bc}	7.02±0.58^{b}	9.94±1.13^{d}	6.81±0.51	0.000	0.000	0.000

*MS: Maize silage; PCM: Parthenium-Cannabis-Maize silage (30:8:60+ 2 Molasses)

^{abcdef}Means bearing different superscripts within the row differ significantly

$^{\#}$T: treatment; P: Period; T x P: Treatment x Period interaction

Table.3 Blood biochemical profile of experimental goats fed maize silage or Parthenium-Cannabis-Maize silage

Attributes/ Treatments*	Days from onset of trial				Treatment Mean± SEM	P value#		
	0th Day	10th Day	20th Day	30th Day		T	P	T x P
Haemoglobin (g/dl)								
MS	9.11	9.47	10.19	11.38	10.04±0.29			
PCM	9.32	9.41	10.50	11.06	10.07±0.27			
Period mean ±SEM	9.21±0.28^{a}	9.44±0.29^{ab}	10.35±0.42^{bc}	11.22±0.30^{c}	10.05±0.20	0.923	0.000	0.911
Total protein (g/dl)								
MS	5.83	5.89	8.20	8.40	7.08±0.27			
PCM	6.06	5.89	8.18	8.73	7.22±0.30			
Period mean ±SEM	5.95±0.19^{a}	5.89±0.15^{a}	8.19±0.18^{b}	8.57±0.18^{b}	7.15±0.11	0.469	0.000	0.884
Albumin (g/dl)								
MS	3.65	4.08	5.88	5.31	4.73±0.22			
PCM	4.26	4.13	4.88	4.62	4.47±0.13			
Period mean ±SEM	3.95±0.19^{a}	4.11±0.16^{a}	5.38±0.20^{b}	4.97±0.22^{b}	4.60±0.13	0.151	0.000	0010
Globulin (g/dl)								
MS	2.19	1.81	2.32	3.09	2.35±0.16			
PCM	1.81	1.75	3.30	4.11	2.74±0.26			
Period mean ±SEM	2.00±0.23^{a}	1.78±0.08^{a}	2.81±0.23^{b}	3.60±0.32^{c}	2.55±0.15	0.077	0.000	0.054
A:G ratio								
MS	2.18	2.34	2.67	1.77	2.24±0.19			
PCM	2.46	2.43	1.55	1.26	1.92±0.16			
Period mean ±SEM	2.32±0.33^{b}	2.39±0.18^{b}	2.11±0.24^{ab}	1.51±0.15^{a}	2.08±0.13	0.171	0.040	0.142
BUN (mg/dl)								
MS	15.02	14.68	14.93	14.9	14.88±0.12			
PCM	15.41	15.34	14.98	14.48	15.05±0.13			
Period mean ±SEM	15.22±0.19	15.01±0.23	14.96±0.13	14.69±0.11	14.97±0.09	0.318	0.203	0.146

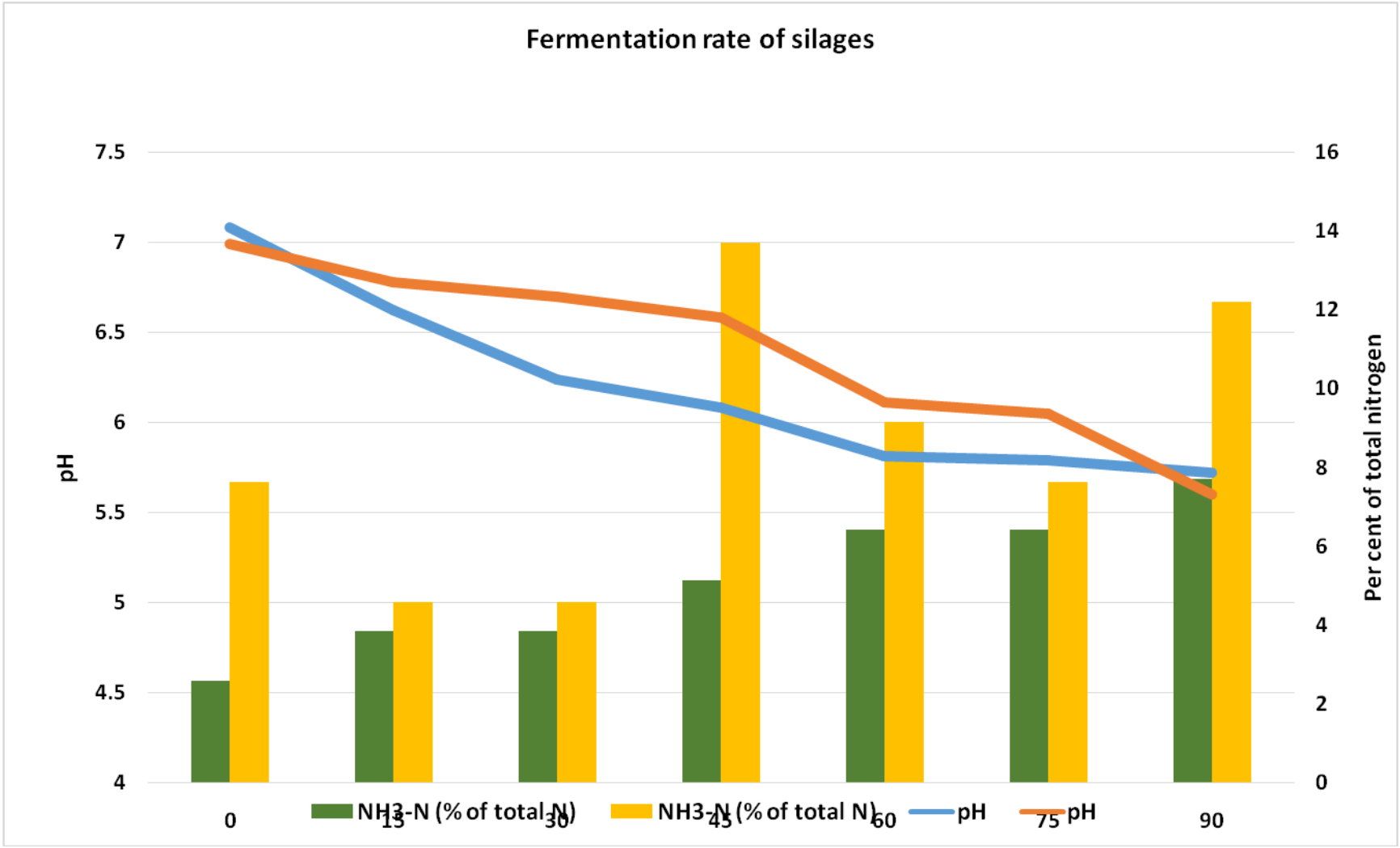
*MS: Maize silage; PCM: Parthenium-Cannabis-Maize silage (30:8:60+ 2 Molasses)
^{abc}Means bearing different superscripts within the row differ significantly

Table.4 Serum enzymes assay of experimental goats fed maize silage or Parthenium-Cannabis-Maize silage

Attributes/Treatments*	Days from onset of trial				Treatment Mean±SEM	P value#		
	0th Day	10th Day	20th Day	30th Day		T	P	T x P
Alanine aminotransferase (ALT;IU/L)								
MS	22.37	22.91	22.60	22.05	22.48±0.49			
PCM	22.00	22.09	22.92	23.04	22.51±0.36			
Period mean ±SEM	22.19±0.69	22.50±0.61	22.76±0.64	22.55±0.51	22.50±0.30	0.963	0.936	0.762
Aspartate aminotransferase (AST; IU/L)								
MS	213.61	202.84	205.38	215.21	209.26±2.97			
PCM	203.95	206.13	213.63	204.01	206.93±3.01			
Period mean ±SEM	208.78±4.53	204.49±3.99	209.50±4.12	209.61±4.52	208.10±2.10	0.590	0.810	0.305

*MS: Maize silage; PCM: Parthenium-Cannabis-Maize silage (30:8:60+ 2 Molasses)
#T: treatment; P: Period; T x P: Treatment x Period interaction
#T: treatment; P: Period; T x P: Treatment x Period interaction

Fig.1 Periodic rate of fermentation assay for silages



The mean total protein level in serum was 7.08±0.27 g/dl in the MS fed group, while that of PCM group was 7.22±0.30 g/dl during the experimental period. There was significant (P<0.01) periodic difference in total protein level of experimental goats, however, the values were comparable (P>0.05) among two dietary treatments. The mean serum albumin content of the animals in the MS fed group was 4.73± 0.22 g/dl and that in case of PCM fed group was 4.47±0.13 g/dl. The mean globulin content of the animals in the MS fed group was 2.35±0.16 g/dl and that of PCM fed group was 2.74±0.26 g/dl. There was significant (P<0.01) periodic difference in Albumin and globulin concentration of experimental goats, however, the values were comparable (P>0.05) among two dietary treatments. Significant interaction (P≤0.01) was observed between observation period and dietary treatment with respect to albumin concentration.

Mean A: G ratio between two dietary group was 2.24±0.19 and 1.92±0.16, respectively for MS and PCM fed groups with no significant (P>0.05) effect of type of silage fed. However, there was significant (P<0.05) periodic difference in A:G ratio of experimental goats. Mean BUN ranged during feeding trial from 14.68 to 15.02 mg/dl in MS fed group and from 14.48 to 15.41 mg/dl in PCM fed group, with no significant (P>0.05) difference between the two groups as well as without any significant (P>0.05) periodic variation. Mean ALT level (IU/L) were 22.48±0.49 and 22.51±0.36 IU/L in MS and PCM silage fed groups, respectively. The ALT level was comparable (P>0.05) among experimental goats, irrespective of the diet as well as observation periods. The overall mean AST level was 209.26±2.97 IU/L in MS fed group and 206.93±3.01 IU/L in PCM fed group, with no significant difference (P>0.05) between the two groups as well as among the periods.

References

Bhoyar, M.G., Gavkare, O.J., Reddy, C.M. and Ghumare, V.S. 2014. Possible uses of Parthenium - An agricultural waste. *Journal of Industrial Pollution Control*, 30: 309-312.

Butsic, V. and Brenner, J.C. 2016. Cannabis (*Cannabis sativa* or *C. indica*) agriculture and the environment: A systematic, spatially-explicit survey and potential impacts *Environmenr Research Letters*, 11: 044023

Evans, H.C. 1997. *Parthenium hysterophorus*: a review of its weed status and the possibilities for biological control. *Biocontrol News and Information*, 18(3): 89-98

Febles, E. 2018. NCSU Researchers Wrap-Up Initial Hemp in Animal Feed Trial. NC State Extension, NC State University, North Carolina. https://industrialhemp. ces. ncsu.edu

Duncan, B.B. 1955. Multiple range and multiple 'F' test: *Biometrics*, 11: 1-42.

Ghosh, S., Haldar, S., Shubhaneel, N., Ganguly, A. and Chatterjee, P.K. 2012. Kinetic study of the acid hydrolysis of *Parthenium hysterophorus* L. for xylose yield in the production of lignocellulosic ethanol. *IOSR Journal of Pharmacy and Biological Sciences*, 3(3): 35-41

Javaid and Shahfique, S. 2010. Seasonal pattern of seed dormancy in *Parthenium hysterophorus* L. *Pakistan Journal of Botany*, 42(1): 497-503.

Khaket, T.P., Aggarwal, H., Jodha, D., Dhanda, S. and Singh, J. 2015. *Parthenium hysterophorus* in current scenario: A toxic weed with industrial, agricultural and medicinal applications. *Journal of Plant Sciences*, 10: 42-53.

Kushwaha, V.B and Maurya, S. 2012. Biological utilities of *Parthenium hysterophorus*. *Journal of Applied and*

Natural Science, 4(1): 137-143.

Kumar, M. and Kumar, S. 2010. Effect of *Parthenium hysterophorus* ash on growth and biomass of *Phaseolus mungo*. *Academia Arena*, 2(1): 98-102.

Nelson, R.A. 2000. Hemp Husbandry (Internet edition). *https://www. hempbasics.com/ hhusb/hh11stcr. htm# HH110*

Saini, A., Aggarwal, N.K., Sharma, A., Kaur, M. and Yadav, A. 2014. Utility potential of *Parthenium hysterophorus* for its strategic management. *Advances in Agriculture*, Article ID 381859. http://dx.doi.org/10.1155/2014/381859

Snedecor, G.W. and Cochran, W.G. 1994. Statistical methods. 8th Edition, East West Press Private Limited, New Delhi.

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