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MASS PRODUCTIVITY AND PERCENTAGE CONTRIBUTION OF PLANT *ECLIPTA ALBA* (HASSK) ASTERACAE

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ABSTRACT: *Eclipta alba* (Hassk) has a hot dry sharp bitter taste, it is flattening alterative, anathematic alexipharmic good for the complexion of hair. The eyes and the teeth, it cures inflammation, hernia, eye diseases, itching and night blindness, used to treat kaph, vita disorders, abortion, miscarriage and uterine pains after delivery (Post natal stage). Growth experiment in mass productivity and percentage contribution were studied of different watering levels and the germinated seeds were transplanted in 23cm diameter pots (val. 7092 cc) approximated containing garden soil at two leaved stage. *E.alba* is belonging to Asteraceae family and mostly grown in many parts of India as medicinal purposes.

KEYWORDS: *Eclipta alba,* Hassk, Asteracae,Thidiazuron, Cytokinin

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1. INTRODUCTION

Protoplasm, the essential constitute of an organism is dynamic substance requiring a continuous exchange of energy and material and there can be procured only by exchange with the outside the world. Plant response at various stages of its life cycle to the variations in stresses of environmental component organization of plant community greatly hampered by lack of information respecting the life history and biotic relations of their constituents and therefore, autecological study of dominant species a proper perspective of community is not possible [1].Duncan and Olmsted [2] , [3] stated that much emphasis on the importance of autecological studies to the applied plant sciences especially forestry, range management, soil conservation and weed control. Dry matter production is the key function in ecological and sociological life of plant and the determination of dry matter production by the plants always constitute the basis for further studies in production ecology [4]. Under any given set of conditions, the daily rate of dry matter production can be determined with three parameters of growth, Net Assimilation Rate (NAR), ratio of total assimilation surface to total plant right and the duration of the productive period within the annual cycle of Nitrogen is a key element in any ecosystem as it is the chief constituent of proteins and it is also an essential constituent of chlorophyll. All compound is important than to study the percentage of nitrogen and phosphorus present in different plant parts [5], [6]. Present study of medicinal plant *E.alba* (Hassk) from the grassland of Kanpur. This plant is perennial herb with high medicinal values. Ecology is primarily a field subject and concerned with the functional inter dependencies between living things and their surroundings. Every living thing is surrounded by materials and forces which constitute its environment and from which it must derive its need. In the present work much emphasis is given on seed germination, production, growth analysis and energy dynamics of *E. alba* (Hassk). According to Lieth [4] the determination of dry matter production by plants always constitutes the basis for further studies in production of ecology. A good deal of the work has been done on the accumulation of biomass and net production in all the structural elements of terrestrial communities[7] , [8] , [9] , [10], [11],[12],[13],[14],[15],[16],[17]. Living part of an ecosystem runs mainly on the energy fixation of vegetation. The ability of plant to manufacture food in presence of limiting factor governs the efficiency of energy fixation. Determination of energy equivalent of biological materials helps in estimation of energy flow and food chains within a biocoenosis. In the present study also, the attempt has been made to visualize relationship between calorific values of *E.alba*(Hassk). The present study deals with the autecology of medicinal plants, *viz*. *E.alba*(Hassk) from the grasslands. It is explained that the variation in response of callus formation may be due to the variation in distribution of endogenous level of growth regulators as observed in many other plants[18],[19] reported the requirement of the cytokinin like compounds, Thidiazuron (TDZ) for effective callus formation in the ornamental plant. It is of common fact that cytokinin is the major growth hormone involved in shoot formation in many plant species [20], [21], [22].

2. MATERIALS AND METHODS

Plant growing in association of *E.alba* (Hassk) at each site throughout the year were identified and recorded as-

Seed Output and Germination

The seed output will be calculated by multiplying the average number of seeds per fruit by average number of fruits per plant. For germination, seeds will be kept in Petri-dishes in between two filter papers placed on a moist cotton pad. Three replicates each of 100 seeds were taken for every experiment. Water was added from time to time in order to maintain necessary moisture level for germination of the seeds. Fresh seeds were used in all experiments. Light intensities maintained to study the effect of intensity of light on seed germination were, 600, 1000, 1300, 1700 and 2100 lux. Intensity was measured with a lux meter.

Biomass and Productivity

To study the dry matter production sampling will be done at fortnight intervals from the seeding to the nature and declining stage of the plants from each site. Twenty plants of apparently similar age will be sampled at random by digging out and washing the monolith of considerable size. Along with plants, soil samples will also be taken in a polythene bag to the laboratory. In the laboratory, leaves, stems, fruits and roots of the plants will be separated and dried in oven at 80˚ for 48 hrs and weighed for Biomass determination (average of 20 plants). The Biomass values thus obtained will be expressed in terms of grams / plants (on dry weight basis). The productivity of different plants parts and total plant will be calculated in terms of grams/ plant / day from monthly difference in dry Biomass. Quantitative growth analytical parameters, viz. net assimilation rate (NAR), relative growth rate (RGR) and leaf area ratio (LAR) will be calculated at monthly intervals by using the well establish formulae given below:

$$RGR = \text{Loge } W_2 - \text{log}W_1 / T_2 - t_1$$

$$LAR = LA / W$$

$$NAR = (W_2 - W_1)(\text{loge}A_2 - \text{loge}A_1) / (t_2 - t_1)(A_2 - A_1)$$

Where,

t_1 = time of first harvesting

t_2 = time of next harvesting

W_1 =total plant dry weight at time t_1

W_2 =total plant dry weight at time t_2

LA =total leaf area

LW = total plant dry weight

A_2 =total leaf area at time t_2

A_1 =total leaf area at time t_1

Plant Energy

Calorific value of plant material was determined from samples collected from different months of the year 1978-79. The samples were dried in oven at 800 C for 48 hrs. Calorific values of leaves, stem and root were determined by burning samples made into pellet in par oxygen Bomb Colorimeter. The pellet was ignited in presence of oxygen and the volume of water taken inside the bucket that surrounds the bomb shell was kept constant throughout in all the combustions. For each sample there replicates were taken and the average is used for determination of calorific value.

3. RESULT AND DISCUSSION

The biomass percentage (fig.1) contribution of stem showed an increasing trend from the very first month onwards up to the month of September at site I and of October at Site II. After this there was a decrease in the percentage contribution of stem up to the month of November at Site I and December at site II. Thepercentage contribution of fruit followed a different trend at all the two study sites. At site I the biomass percentage contribution increased with increase in age of the plant up to the month of April. At Site II it decreased up to the month of January and after this, there was a continuous increase up to the month of April. At site II there was increase in the month of April followed by a continuous increase up to the month of April. At all the two study sites there was a decrease in the percentage contribution of fruit in the month of May.The biological world run mainly at the expense of material and energy capital accumulated as a result of photosynthesis with increasing emphasis on the measurement of the rate of gross and net productivity of terrestrial and aquatic communities. The rate of utilizing the sunlight in regulating the energy flow in an ecosystem becomes evident.The variation in the biomass percentage contribution of leaf, stem, fruit and root of *E.alba* (Hassk) to the entire plant biomass with respect to time (table 1). There was an initial increase in biomass percentage contribution of leaf at all the two sites up to the month of July, but after this the trend was much different at all the study sites and there was much fluctuation in the percentage contribution of leaves were recorded in the month of July. Site II showed the maximum percentage contribution of leaves followed by site I and site II (46.4 and 38.2 and 38.2 per cent respectively). Minimum percentage contribution of leaves recorded were 26.7 per cent at site I in the month of February, 49.7 per cent at site II in the month of April.The maximum biomass percentage contribution of stem were 39.2 per cent at site I and 40.0 per cent at site II (both in month of October) and the minimum were 12.1 per cent at site II, 40.5 per cent at site I (all in the month of June). The maximum percentage contributions of fruits were recorded in the month of April at the two study sites (12.6 and 11.2 per cent for Site I and Site II respectively). The percentage contribution of root was maximum in the seeding stage at each site (56.4 and 60.2 per cent for site I and II respectively), after which it followed a decreasing trend up to the month of September at all the two study sites. The values of minimum percentage contribution of root were obtained in the month of April at all the two study sites (21.2 and 22.3 per cent for site I and II respectively) and productivity of leaves increased rapidly with increase in age of the plant up to the month of August at Site I and at September study site II. It was on the minus side during the month of September, October and May at Site I, October, November and January and May at Site II. In March and April it again showed a rapid increase at all the study sites. The maximum productivity was obtained in the month of Sept. at site II and I in the month of May (0.302 and 0.398 g/ plant/ month respectively). The productivity of stem also showed the same trend of leaf and the maximum productivity recorded were 640 in the month of August and 0.490g/ plant / month in the month of Sept. at Site I and II respectively(table and fig.2). The productivity of fruits was initially obtained in the month of November at the both study sites (.056 and 0.040 g/ plant/ month at site II and site I respectively) and productivity of fruits was on the minus side in the month of May at site I whereas at the site II, it was on the minus side during May and January. But the maximum productivity recorded at site I and Site II was same in the month of March (.120 and .126 g/ plant/ month). The maximum values were obtained in the month of August at site I (.349 g/ plant/ month) whereas site II showed maximum productivity in the month of Sept and the maximum values for shoot and total plant were 1.038 and 1.387 g/ plant/ month at site I, 0.792 and 1.000 g/ plant/ month at site II. The productivity of all the plant parts, shoot and total were on the minus side in the month of May, because in this month the plant biomass showed much reduction due to the drying of the plant (table and fig.3).

Table: 1Variation in percentage biomass contribution of different plant parts of *Eclipta alba* (Hssk) in relation to age different study sites.

Mon	Site I				Site II			
	Leaf	Stem	Fruit	Root	Leaf	Stem	Fruit	Root
June	33.1	10.5	-----	56.4	27.7	12.1	-----	60.2
July	46.4	18.1	-----	35.5	38.2	20.0	-----	41.8
Aug.	33.0	39.2	-----	27.8	47.5	29.5	-----	33.0
Sep.	31.6	38.4	-----	30.0	33.5	40.0	-----	26.5
Octo.	32.1	37.7	-----	30.2	33.0	40.5	-----	26.5
Nov.	30.6	38.7	3.1	27.6	29.0	34.0	4.7	32.3
Dec.	30.2	37.6	4.4	27.8	31.6	34.5	6.3	27.6
Jan.	30.6	37.4	4.8	27.2	30.1	36.5	4.9	28.5
Feb.	30.0	36.1	7.1	27.8	29.1	36.8	5.7	28.4
Mar.	29.4	36.1	10.2	24.1	29.4	33.5	10.7	26.4
Ap.	28.9	37.3	12.6	21.2	27.4	37.1	11.2	22.3
May	26.7	36.9	6.9	29.5	29.7	23.7	8.0	38.6

Table: 2 Variation in net primary productivity (g/plant/month) of *Eclipta alba* (Hssk) in relation to age at different study sites different soil texture and organic matter treatment.

Plant Age	Garden loam			Sand+ garden loam (1:1)			Sand			Sand + Garden + dung manure (1:1:1)			Garden loam + Dung manure(1:1)		
	Root	Shoot	Total	Root	Shoot	Total	Root	Shoot	Total	Root	Shoot	Total	Root	Shoot	Total
60	0.042	0.159	0.201	0.039	0.142	0.181	0.044	0.133	0.177	0.044	0.165	0.209	0.049	0.174	0.223
90	0.078	0.612	0.690	0.067	0.578	0.645	0.070	0.621	0.621	0.075	0.631	0.706	0.085	0.627	0.712
120	0.004	-.064	-.060	-.007	-.042	-.049	0.016	-.097	-.081	0.013	-.087	-.074	-.003	.163	-.166
150	0.008	-.095	-.087	0.018	0.058	0.076	0.019	0.045	0.064	0.006	0.047	0.053	0.022	0.122	0.144
180	0.005	0.038	0.043	0.013	0.058	0.071	0.008	0.048	0.056	0.012	0.054	0.066	0.014	0.084	0.098
210	0.020	0.145	0.165	0.036	0.162	0.198	-.007	-.005	-.012	0.007	0.140	0.147	0.024	0.150	0.174
2640	0.033	0.070	0.103	0.017	-.449	-.032	0.012	-.020	-.008	0.023	0.118	0.141	0.024	0.126	0.150
300	----	0.251	0.292	0.021	0.245	0.266	0.018	0.248	0.266	0.043	0.148	0.191	0.044	0.257	0.301
330	0.058	0.177	0.235	0.021	0.265	0.286	0.059	0.142	0.201	0.036	0.134	0.170	0.046	0.230	0.276
360	-.380	-.423	-.193	-.052	-.848	-.900	-.060	-.830	-.890	-.067	-.889	-.956	-.049	-.907	-.956

Table: 3 Variation in dry biomass (g/plant) of Eclipta alba (Hssk) in relation to age at different study sites.

Month	Sites I						Sites II					
	Leaf	Stem	Fruit	Root	Shoot	Total	Leaf	Stem	Fruit	Root	Shoot	Total
Jun	0.041 +.003	0.013 +.006	----	0.070 +.001	0.054	0.124	0.039 +.008	0.017 +.009	----	0.085 +.003	0.056	0.141
Jul	0.210 +.021	0.082 +.004	----	0.161 +.039	0.292	0.453	0.149 +.034	0.078 +.041	----	0.163 +.009	0.227	0.390
Aug	0.608 +.101	0.722 +.114	----	0.510 +.121	1.330	1.840	0.320 +.041	0.252 +.029	----	0.282 +.054	0.572	0.854
Sept	0.522 +.098	0.649 +.109	----	0.482 +.078	1.171	1.653	0.622 +0.97	0.742 +.104	----	0.490 +.087	1.364	1.854
Oct	0.342 +.045	0.402 +.067	----	0.322 +.039	0.744	1.066	0.521 +.084	0.639 +.097	----	0.418 +.096	1.160	1.578
Nov	0.398 +.063	0.504 +.084	0.040 +0.03	0.360 +.036	0.942	1.302	0.342 +.043	0.401 +.054	0.056 +.005	0.380 +.049	0.799	1.179
Dec	0.360 +.031	0.448 +.048	0.052 +.004	0.333 +.056	0.860	1.193	0.460 +.079	0.502 +.114	0.092 +.007	0.402 +.064	1.054	1.456
Jan	0.392 +.027	0.480 +.039	0.086 +.006	0.350 +.238	0.933	1.283	0.380 +.047	0.460 +.098	0.062 +.008	0.360 +.043	0.902	1.262
	0.428 +.061	0.515 +.048	0.102 +.007	0.382 +.061	1.045	1.427	0.432 +0.54	0.546 +.067	0.084 +.004	0.422 +.076	1.062	1.484
Mar	0.640 +.084	0.785 +.059	0.222 +0.03	0.521 +.078	1.647	2.168	0.580 +.049	0.660 +.094	0.210 +.038	0.520 +.083	1.450	1.970
Apr	0.732 +.102	0.946 +.108	0.320 +.027	0.537 +.053	1.998	2.535	0.740 +.108	1.052 +.206	0.302 +.046	0.062 +.108	2.094	2.696
May	0.310 +.027	0.428 +.034	0.080 +.006	0.342 +.041	0.818	1.160	0.328 +.042	0.262 +.038	0.088 +.009	0.248 +.084	0.678	1.106

Figure: 1 Percentage biomass (Y- Percentage, X-Months)

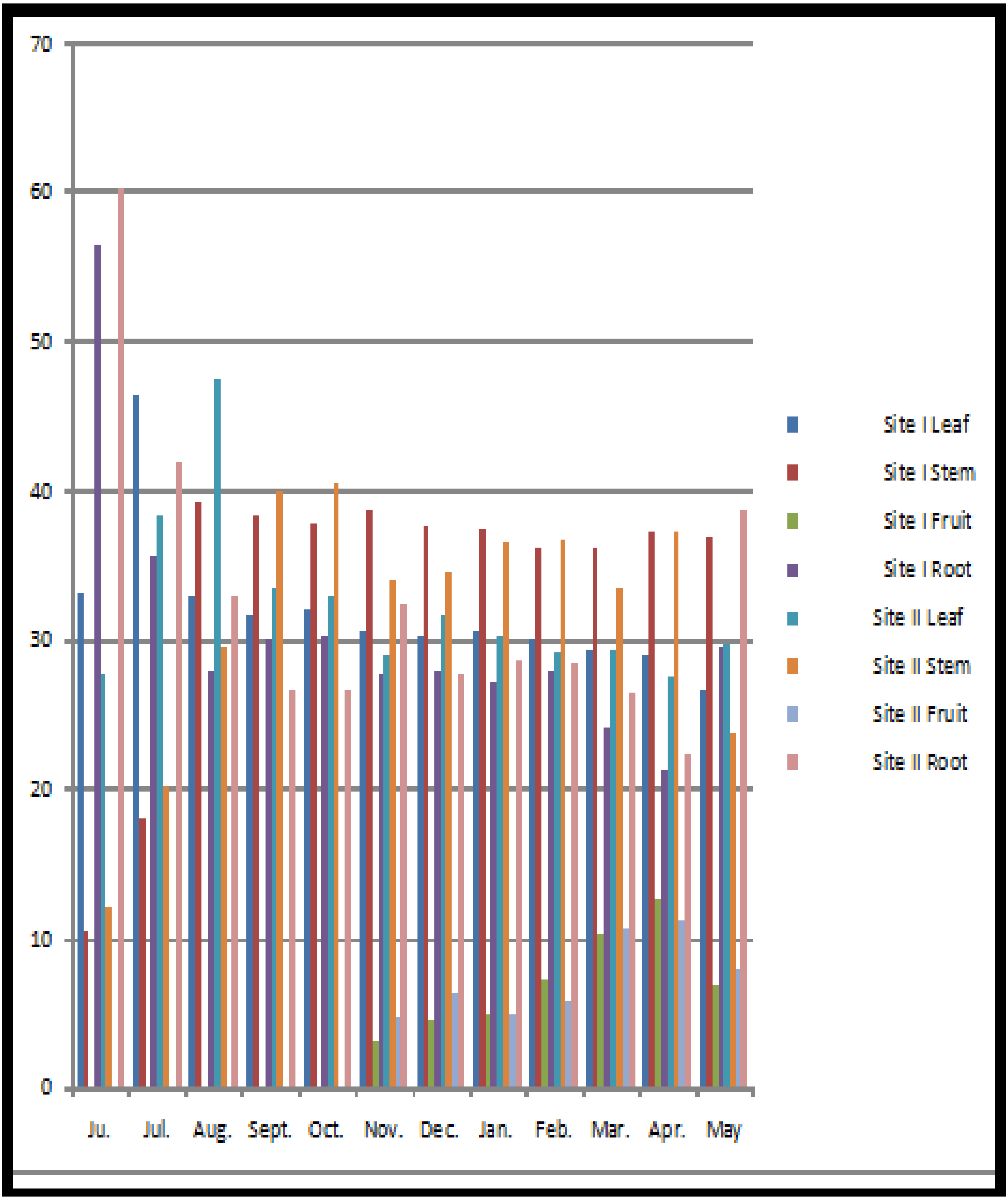


Figure: 2 Net primary productivity (g/plant/month) of *Eclipta alba*

(Y-% Relative Cell Migration, X-Productivity)

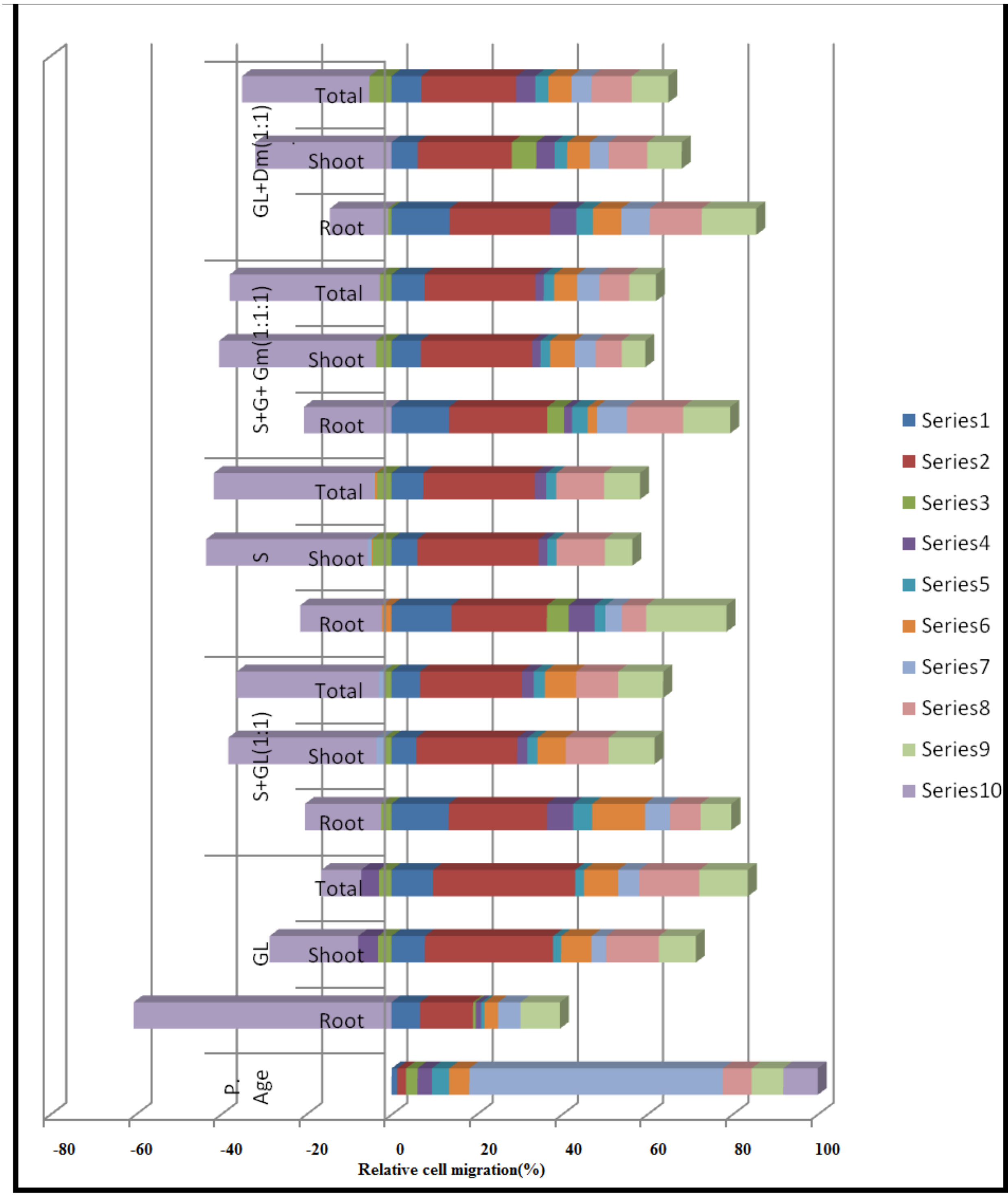
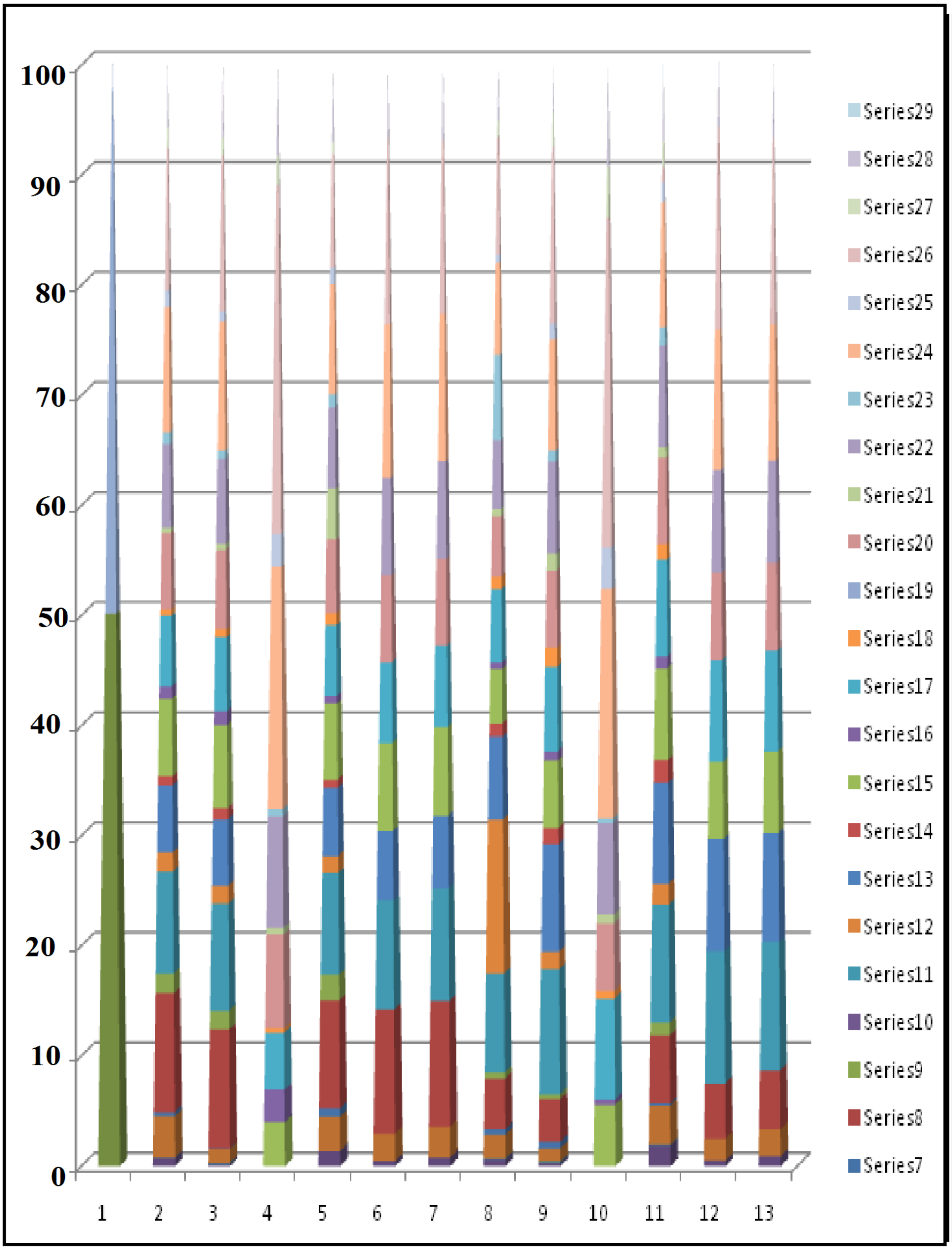


Figure: 3 Dry biomasses (g/plant) of Eclipta alba (Hssk)

Y-Percentage, X- Series



4. CONCLUSION:

In contrast the biomass percentage contribution of root, stem, leaf and fruit of *E.alba* (Hassk) to the entire plant biomass with respect to time and growth of plant. The root was maximum in the seeding stage at each site (56.4 and 60.2 per cent for site I and II respectively), after which it followed a decreasing trend up to the month of September at all the two study sites and maximum productivity was obtained in the month of Sept. at site II and I in the month of May (0.302 and 0.398 g/ plant/ month respectively). The productivity of stem also showed the same trend of leaf and the maximum productivity recorded in the month of August. The maximum biomass percentage contribution of stem were 39.2 per cent at site I, 40.0 per cent at site II (both in month of October) and the minimum were 12.1 per cent at site II and 40.5 per cent at site I (all in the month of June). There was an initial increase in biomass percentage contribution of leaf at all the two sites up to the month of July but after this the trend was much different at all the study sites and there was much fluctuation in the percentage contribution of leaves were recorded in the month of July. Site II showed the maximum percentage contribution of leaves followed by site I and site II (46.4 and 38.2 and 38.2 per cent respectively). The maximum percentage contributions of fruits were recorded in the month of April at the two study sites (12.6 and 11.2 per cent for Site I and Site II respectively) and productivity of fruits was initially obtained in the month of November. . The productivity of all the plant parts such as shoot and total were on the minus side in the month of May because in this month the plant biomass showed much reduction due to the drying of the plant.

5. CONFLICT OF INTEREST:

The authors confirm that this article content has no conflicts of interest.

6. ACKNOWLEDGMENT:

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