



Research Article

Aggregation and regeneration capacity of vegetation in Kotli hills, Azad Jammu and Kashmir

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ARTICLE INFO	ABSTRACT
Article No.: 102512151 DOI: 10.15580/GJAS.2012.8.102512151 Submitted: 25/10/2012 Accepted: 10/10/2012 Published: 30/12/2012 *Corresponding Author Muhammad Shoaib Amjad E-mail: malikshoaib1165@yahoo.com	Degree of aggregation and age classes in forests of Kotli hills were recorded in relation to environmental variable and underlying anthropogenic influence. Aggregated species (36.27%) were dominant in the area followed by the intermediate species with share of 36.27 and 33.16 respectively. Similarly regeneration capacity of the forest shows that <i>Pinus roxburghii</i> and <i>Punica granatum</i> were the only regenerating species in the investigated area. The remaining eight species viz: <i>Olea ferruginea</i>, <i>Quercus dilatata</i>, <i>Flacourtia indica</i> <i>Celtis eriocarpa</i>, <i>Grewia villosa</i>, <i>Acacia modesta</i>, <i>Ficus palmata</i> and <i>Mallotus philipensis</i> were not regenerating due to deforestation and overgrazing. These species are in endangered condition.
Keywords: Aggregation, Regenerating Capacity, Kotli, <i>Pinus roxburghii</i>, <i>Acacia community</i>	

INTRODUCTION

Aggregation may be possible due to favourable condition occurring at certain habitat and site. The communities occurring at dry and degraded site show spacing and individual are dispersed. High organic matter helps in aggregation. Similarly, age classes tell us about plant health and wealth.

The climate of Kotli hills is subtropical and humid type with average annual rainfall of 92.5mm. The maximum rainfall occurs during July amounting to 277.2mm, while least rainfall occurs during November amounting to 15.1mm. The hottest months of the year are June and July, with mean daily maximum temperature of 37.3 °C and 34.3 °C respectively, and minimum temperature of 19.7 °C and 17.9 °C respectively. The average maximum and minimum relative humidity received by the area is 79.8% and 34.3% respectively.

Where

D = Observed density

d = Expected density

The species having value more than 2 is aggregated.

If the value is less than 1, species is regular.

If observed and expected densities are equal then it is unity or random

When a value is in between 1 and 2 then species is intermediate, (Curtis and Cottom, 1950)

The distribution of plant in different age classes indicates regenerating capacity of forest, i.e. weather regenerating decline or still stand. It was calculated after Malik, 2005. Total classes were 12 by taking class interval of 20Cm.

RESULTS

The degree of aggregation was calculated in thirteen communities which are as following

1 - *Olea-Malvastrum-Adhatoda* community

This community consisted of 24 species. Out of which 12.5% were regular, 45.83% aggregated, 37.5% intermediate and 4.16% were unity. The dominant species were aggregated. (Table 1)

2 - *Acacia* community

Acacia community comprised of 20 species. There were 20% regular, 55% aggregated, and 25% were intermediate. Aggregated species were dominant. (Table 1)

3 - *Brachiaria-Themeda* community

There were 31 species in all. Out of which 41.93% were regular, 16.12% Aggregated and 41.93% intermediate.

Very little work has been done on aggregation and regenerating capacity. The only available references for Azad Jammu and Kashmir are that of Malik (2005) and Malik (2007) who recorded the aggregation and regenerating capacity of Gang Chotti (Bagh) and Pirchanasi (Muzaffrabad). This type of work is helpful for the other ecologist working in other localities of the same area for the verification of their results.

MATERIALS AND METHODS

The investigated area lies in between longitude 73° 53' 5.316" east and latitude 33° 32' 9.925" north, at an elevation of 590-1860m. The climate of area is of subtropical and humid type.

Degree of aggregation was measured through index developed by Curtis and Cottom (1950), which is as

$$A = \frac{D}{d}$$

Aggregated species were dominant in this community. (Table 1)

4 - *Themeda-Pinus- Dodonaea* community

Themeda-Pinus- Dodonaea community comprised of 31 species in all. Out of which 29.03% regular, 35.48% aggregated, 35.48% were intermediate. This community was dominated by regular and aggregated species. (Table 1)

5 - *Themeda-Pinus-Olea* community

This community consisted of 38 species. Out of which 31.58% were regularly distributed, 28.95% aggregated, 34.21% intermediate and 5.26% unity. Regular species were dominant in this community. (Table 1)

6 - *Pinus* community I

The total species in this community were 34. Out of which 20.58% were regular, 38.23% aggregated, 32.35% intermediate and 8.82% were unity. This community was dominated by aggregated species. (Table 1)

7 - *Pinus* community II

Pinus community composed of 21 species. There were 14% regular species, 33% aggregated, 48% intermediate and 5% Unity. Intermediate species were dominant in this community. (Table 1)

8 - *Pinus* community III

This community composed of 32 species. There were 25% regular, 34% aggregated, 38% intermediate and 3% unity. This community was dominated by intermediate species. (Table 1)

9 - *Pinus* community IV

Total species in this community were 31 in which 42% were regular, 32% aggregated, 23% intermediate and 3% unity. Regular species were dominated in this community. (Table 1)

10 - *Dicliptera* community

This community consisted of 28 species. Out of which 21% were regular, 46% aggregated, 29% intermediate and 4% unity. Aggregated species were dominant in this community. (Table 1)

11 - *Pinus* community V

There were 26 species in this community. 30.77% were regularly distributed, 34.61% were aggregated, and

30.77% intermediate and 3.85% were unity. The community was dominated by aggregated species. (Table 1)

12 - *Pinus* community VI

Pinus community composed of 32 species in which 25% were regular, 34.37% were aggregated, 34.37% were intermediate and 6.25% were unity. Aggregated and intermediate species were dominant in this community. (Table 1)

13 - *Rubus-Quercus-Pinus* community

This community consisted of 38 species. There were 21.05% regular, 44.74% aggregated, 26.31% intermediate and 7.89% unity. This community was dominated by aggregated species. (Table 1)

Table 1: Degree of aggregation of different plant communities recorded from Kotli Hills during Monsoon 2010

S. No	Community	Height (m)	Total Sp.	R		A		I		U	
				No	%	No	%	No	%	No	%
1	O-M-A	590	24	3	12.5	1	4.17	9	37.5	1	4.17
2	A-L	620	20	4	20.0	1	5.0	5	25.0	-	-
3	B-T	650	31	1	3.23	5	16.13	1	3.23	-	-
4	T-P-D	850	31	9	29.03	1	3.23	1	3.23	-	-
5	T-P-O	970	38	1	2.63	1	2.63	1	2.63	2	5.26
6	P	1090	34	7	20.58	1	2.94	1	2.94	3	8.82
7	P	1200	21	3	14.28	7	33.33	1	4.76	1	4.76
8	P	1300	32	8	25.0	1	3.12	1	3.12	1	3.12
9	P	1400	31	1	3.23	1	3.23	7	22.58	1	3.23
10	D	1500	28	6	21.42	1	3.57	8	28.57	1	3.57
11	P	1620	26	8	30.77	9	34.61	8	30.77	1	3.85
12	P	1735	32	8	25.0	1	3.12	1	3.12	2	6.25
13	R-Q-P	1860	38	8	21.05	1	2.63	1	2.63	3	7.89
Total			386	10	26.17	4	10.36	2	5.18	6	15.54

Key:

O-M-A = *Olea-Malvastrum-Adhatoda* community

A = *Acacia- Lespedeza* community

B-T = *Brachiaria-Themeda* community

T-P-O = *Themeda-Pinus-Olea* community

R=Regular I= Intermediate

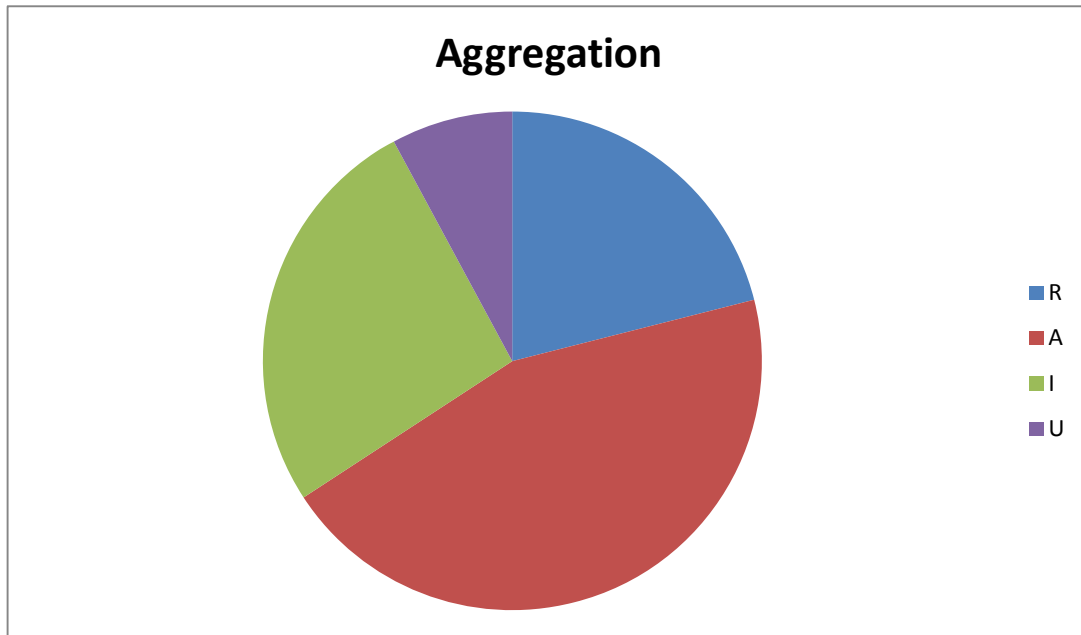
P = *Pinus* community

D = *Dicliptera* community

R-Q-P = *Rubus-Quercus-Pinus* community

T-P-D = *Themeda-Pinus- Dodonaea* community

A= Aggregated U= unity

Graphical representation of Degree of Aggregation

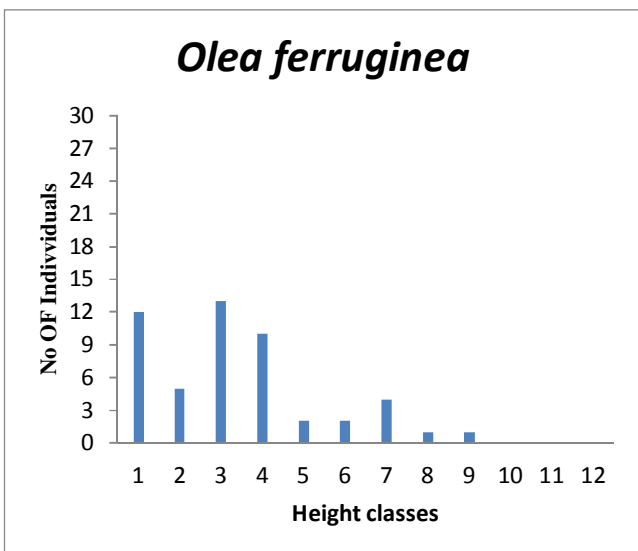
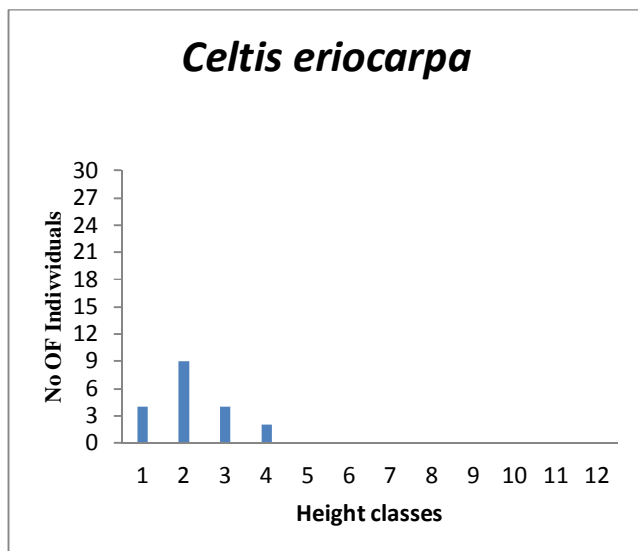
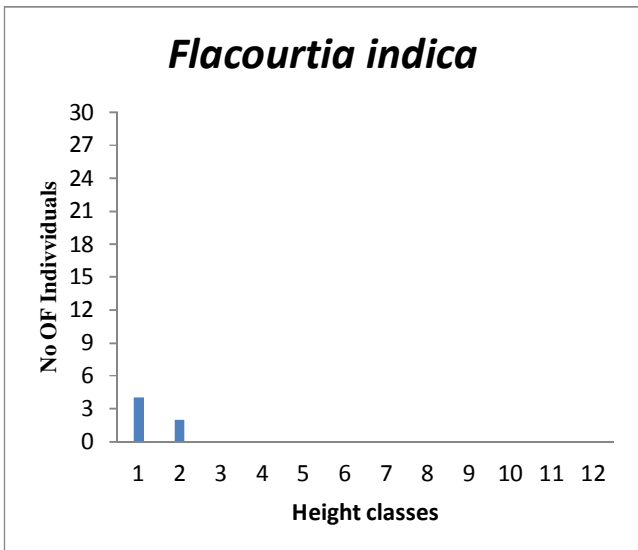
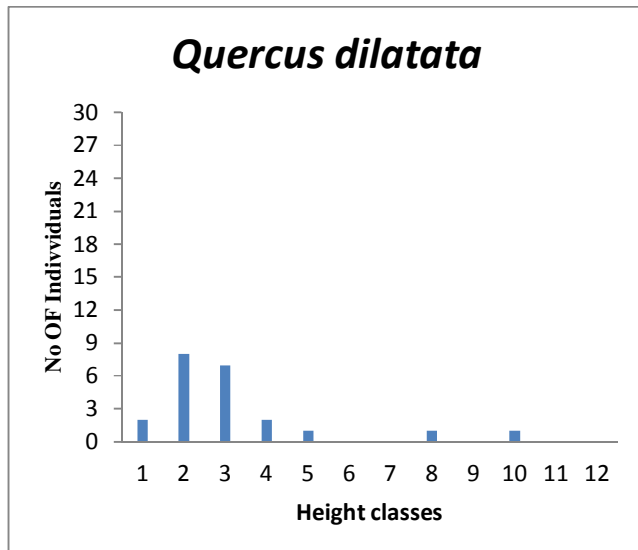
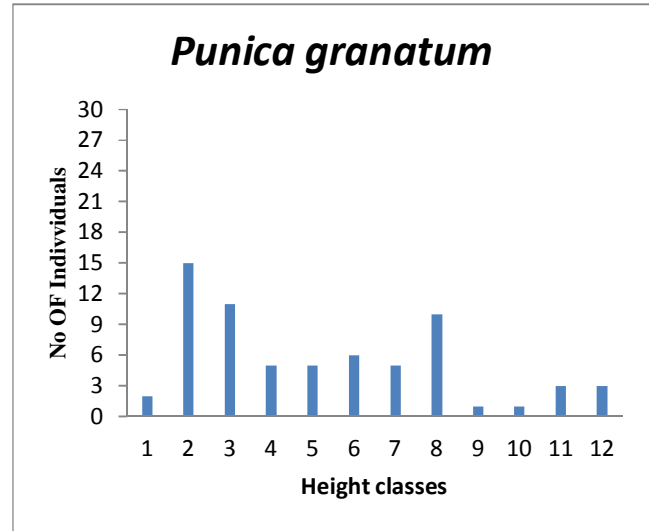
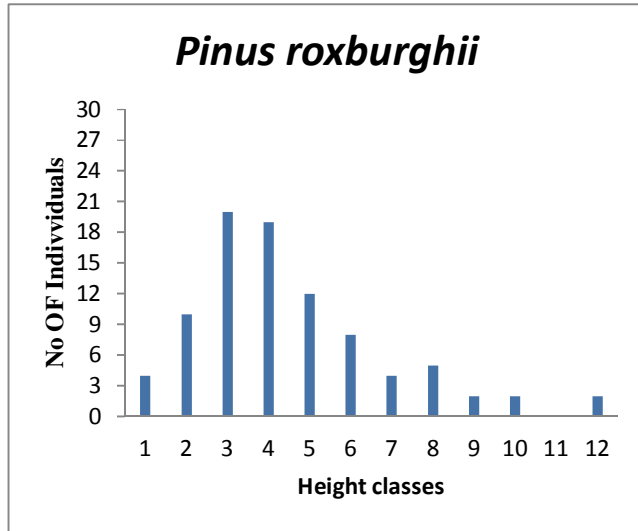
For the estimation of age classes tree of each of the species in different girth classes were recorded. The data shows that only *Pinus roxburghii* and *Punica granatum* were the regenerating species. The

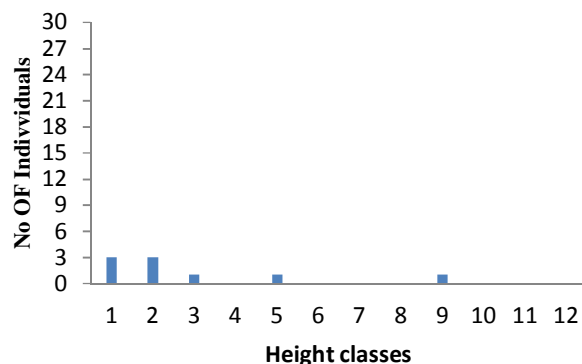
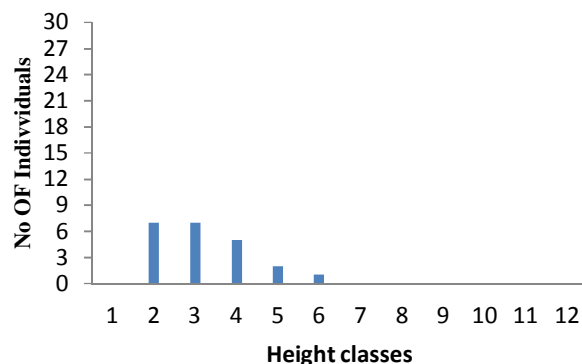
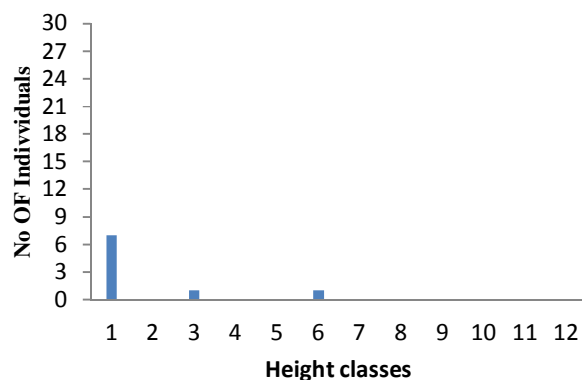
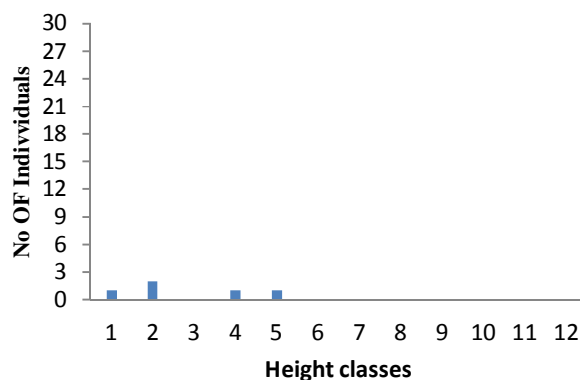
remaining eight species viz: *Olea ferruginea*, *Quercus dilatata*, *Flacourtia indica*, *Celtis eriocarpa*, *Grewia villosa*, *Acacia modesta*, *Ficus palmata* and *Mallotus philipensis* were not regenerating (Table 2).

Table 2: Regenerating capacity based on age classes of trees from Kotli Hills during Monsoon 2006

S.No	Nam of species	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-1800	180-200	200-220	More than 220cm
	<i>Pinus roxburghii</i>	4	10	20	19	12	8	4	5	2	2	-	2
	<i>Punica granatum</i>	2	15	11	5	5	6	5	10	1	1	3	3
	<i>Quercus dilatata</i>	2	8	7	2	1	-	-	1	-	1		
	<i>Flacourtia indica</i>	4	2	-	-	-	-	-	-	-	-	-	-
	<i>Celtis eriocarpa</i>	4	9	4	2	-	-	-	-	-	-	-	-
	<i>Olea ferruginea</i>	12	5	13	10	2	2	4	1	1	-	-	-
	<i>Grewia villosa</i>	3	3	1	-	1	-	-	-	-	-	-	-
	<i>Acacia modesta</i>	-	7	7	5	2	1	-	-	-	-	-	-
	<i>Ficus palmata</i>	7	-	1	-	-	1	-	-	-	-	-	-
	<i>Mallotus philipPensis</i>	1	2	-	1	1	-	-	-	-	-	-	-

Graphical representation of Regenerating Capacity



Grewia villosa***Acacia modesta******Ficus palmata******Mallotus philipPensis*****DISCUSSION**

The aggregation of plants occurs in response to local habitat differences, in response to daily and seasonal weather changes and as the result of reproductive processes. The aggregation is inversely related to the mobility of disseminules (seeds, spores etc.), Odum, 1971. Weaver and Clements (1929) recorded random and non-random dispersal patterns. In the investigated area aggregated species were dominant followed by intermediate species. The species that have rhizome, runner, sucker, and other similar mode of vegetative multiplication exhibited aggregation which is clear in the community like *Olea-Malvastrum-Adhatoda* community, *Acacia* community, *Themeda-Pinus- Dodonaea*, *Pinus* community and *Rubus-Quercus-Pinus* community.

Dominant grasses such as *Themeda anathera*, *Heteropogon contortus*, *Brachiaria eruciformis*, *Cynodon dactylon*, *Poa annua* and *Poa inferma* etc show aggregation due to perennial, rhizomatous habit and enormous number of seed output. Furthermore *Carissa*, *Maytenus*, *Ziziphus* and *Astragalus* also behave similarly.

The results are in agreement with Malik (1986) and Curtis and Cottom (1950) who reported similar finding. Aggregation might possibly due to prevailing condition in certain localities. Soil moisture is also one of the factors helping in the aggregation of species.

Communities such as *Pinus* communities and *Rubus-Quercus-Pinus* community harbouring in moist tend to aggregate. Shrubs and herbs are usually aggregated as in *Olea-Malvastrum-Adhatoda*, *Themeda-Pinus-Dodonaea* and *Rubus-Quercus-Pinus* community.

Regeneration capacity is the ratio of different age group to each other at given time. *Pinus roxburghii* and *Punica granatum* was the only tree species dominating which are regenerating up to 220cm. *Olea ferruginea* is regenerating up to 160Cm and *Quercus* up to 100Cm. The remaining eight species were not found in the bigger classes showing no regeneration due to deforestation. Some of the plant species shows lesser number of trees in higher size classes. These forests showed unstable and degraded situation. They must be maintained for future. In most of the species gaps were seen. The gaps are defined as the classes with less number of individual than those on

either side. (Ahmed and Ogden,1987). On the basis of disturbed nature and past history of these forests, it may be suggested that gaps in these forest may be due to removal of particular sized tree or no regeneration in the past. This pattern of tree structure indicates inadequate recruitment (Night, 1975) producing unstable population. It may be concluded that due to anthropogenic disturbance these forest are in unstable and degraded state therefore prompt conservation steps should be immediately taken to save these ecologically and economically important species.

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