Performance of SC/ST candidates in qualifying CSIR–UGC National Eligibility Test for JRF to pursue doctoral research

Government of India through its various departments/agencies has implemented a number of scholarship/fellowship schemes for weaker sections of the society, especially for the Scheduled Castes (SC) and Scheduled Tribes (ST) students. The Ministry of Tribal Affairs and the Ministry of Social Justice and Empowerment, under the centrally operated scheme, provide scholarships to SC/ST students for pre-matric and post-matric education[1,2]. The objective of the scheme is to minimize the drop-out rate and to motivate SC/ST students to pursue higher education[1,2]. Dr Ambedkar Foundation, set up under the aegis of the Ministry of Social Justice and Empowerment, also provides National Merit Scholarships to meritorious SC/ST students[3]. Four SC and four ST toppers of class X from each of the 29 examination boards are awarded scholarships for pursuing higher studies each year. The number of beneficiaries under these schemes is summarized in Table 1.

The University Grants Commission (UGC) conducts National Eligibility Test (NET) in the area of Humanities and Social Sciences, wherein candidates belonging to SC/ST category are given special consideration in the award of Junior Research Fellowships (JRFs)[4]. About 480 fellowships are awarded to SC and 240 to ST candidates each year (Table 2). UGC also awards 100 fellowships to SC/ST candidates to undertake post-doctoral research in science, engineering and technology, humanities and social sciences[4]. Department of Biotechnology (DBT), Ministry of Science and Technology, awards about 275 JRFs every year for pursuing Ph D in the area of Biotechnology and Applied Biology through a national level exam wherein relaxation in marks and age is given to both SC and ST candidates[5]. Indian Council of Medical Research (ICMR), Ministry of Health and Family Welfare (MoHFW), which awards JRFs in biomedical sciences and social sciences through a national level exam, also gives special consideration to SC/ST candidates as per their policy guidelines[6]. Two thousand fellowships are available for SC and 667 fellowships for ST students every year under the Rajiv Gandhi National Fellowship (RGNF) Scheme[1,2], funded by the Ministry of Social Justice and Empowerment and the Ministry of Tribal Affairs to pursue higher studies such as M Phil and Ph D in science, humanities, social science, engineering and technology (Table 2). ST students are also offered fellowships by the Ministry of Tribal Affairs under 'National Overseas Scholarship' Scheme to pursue higher studies abroad[1]. The main thrust of the scheme is to increase employability of ST students for their socio-economic development[1].

The Council of Scientific and Industrial Research (CSIR) started Junior Research Fellowship (JRF) scheme through NET in 1983 with the objective to identify and nurture young scientific talent for pursuing doctoral studies in universities and R&D institutions across the country[7]. Over the years, the scheme has helped India to strengthen the stock of highly qualified scientific manpower in the country. About 2400 JRFs are awarded through each NET conducted in June and December every year. Out of these, 1200 fellowships are transferred to UGC for support on its request. Age relaxation up to 5 years along with relaxation in examination fee and qualifying

Table 1. Post-matric scholarships awarded by the Ministry of Tribal Affairs and the Ministry of Social Justice and Empowerment to ST and SC students

Year	ST students	SC students	National merit scholarships through Dr Ambedkar Foundation to SC and ST students
2010–11	1,374,767	4,292,337	232
2011–12	1,775,240	4,820,849	232
2012–13	1,867,067	5,172,501	232
2013–14	2,034,563	5,277,496	232

Source: http://tribal.nic.in; http://socialjustice.nic.in; and http://ambedkarfoundation.nic.in

Table 2. Fellowships awarded by the Ministry of Tribal Affairs and the Ministry of Social Justice and Empowerment under RGNF; UGC through its UGC–JRF NET in humanities and social science; DBT and ICMR for higher studies to SC and ST students

Year	RGNF for higher studies		UGC–JRF NET in humanities and social sciences		Total number of fellowships awarded including those awarded to SC/ST by DBT in biotechnology and applied biology	Total number of fellowships awarded including those awarded to SC/ST by ICMR in biomedical and social sciences
	No. of slots for SC	No. of slots for ST	No. of slots for SC	No. of slots for ST		
2012–13	2000	667	480	240	277 (60)	212 (37)
2013–14	2000	667	480	240	281 (62)	168 (30)

Figures in parentheses represent fellowships awarded to SC/ST students.
Source: Ministry of Tribal Affairs and Ministry of Social Justice and Empowerment; UGC; DBT and ICMR for respective fellowships.

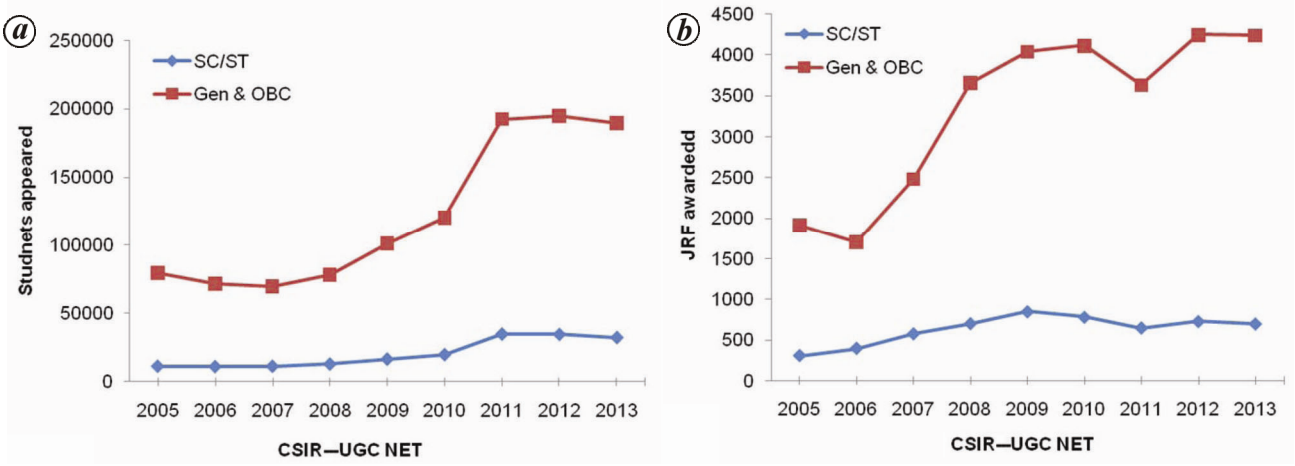

Figure 1. Number of students appeared for NET (***a***) and JRF awarded (***b***) from SC/ST and General/OBC category during 2005–2013.

Table 3. Subject-wise number of General/OBC and SC/ST candidates appeared for NET-JRF during 2005–2013

Subject	Chemical sciences		Earth sciences		Life sciences		Mathematical sciences		Physical sciences		Engineering sciences	
Year	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST
2005	19,041 (87)	2,752 (13)	2,027 (78)	576 (22)	36,126 (86)	6,111 (14)	10,641 (93)	849 (7)	11,671 (91)	1,224 (9)		
2006	17,866 (86)	2,933 (14)	1,597 (77)	487 (23)	32,491 (85)	5,795 (15)	9,137 (92)	794 (8)	10,817 (90)	1,243 (10)		
2007	18,265 (85)	3,301 (15)	1,301 (78)	367 (22)	31,640 (85)	5,681 (15)	8,165 (90)	902 (10)	10,313 (89)	1,265 (11)		
2008	18,860 (84)	3,632 (16)	1,280 (75)	428 (25)	29,908 (84)	5,562 (16)	7,604 (89)	932 (11)	9,672 (89)	1,250 (11)		
2009	28,483 (85)	4,902 (15)	2,508 (78)	725 (22)	46,886 (85)	8,113 (15)	11,560 (89)	1398 (11)	11,785 (89)	1,522 (11)		
2010	33,615 (85)	5,997 (15)	3,291 (77)	976 (23)	55,649 (86)	9,345 (14)	14,117 (89)	1722 (11)	13,865 (88)	1,894 (12)		
2011	53,801 (84)	10,308 (16)	7,492 (78)	2,088 (22)	85,511 (84)	16,123 (16)	21,954 (88)	2879 (12)	23,424 (87)	3,416 (13)		
2012*	48,752 (85)	8,566 (15)	7,788 (78)	2,141 (22)	78,971 (84)	14,696 (16)	19,761 (88)	2740 (12)	22,185 (87)	3,304 (13)	17,215 (85)	3,108 (15)
2013	39,930 (86)	6,711 (14)	6,681 (79)	1,758 (21)	61,102 (85)	11,084 (15)	17,731 (88)	2464 (12)	20,339 (88)	2,858 (12)	43,412 (85)	7,392 (15)
Overall relative percentage (%) during the period 2005–2013	85	15	78	22	85	15	89	11	88	12	85	15

Figures in parentheses represent relative proportion; *NET in engineering sciences started in 2012.

marks is given to SC/ST students to attract them for pursuing higher studies in science and engineering and thereby in opting science and engineering as a career[7].

The acceptability and popularity of CSIR–UGC NET has been constantly on the rise, as evident from continued increase in the number of candidates who appeared over the years[8]. The present study was conducted to determine the enrollment (number of candidates appeared) and selection pattern of students belonging to SC/ST category in comparison to those of General and OBC category in NET during the period 2005–2013.

Data with respect to candidates, who appeared for CSIR–UGC NET and got qualified for the award of JRFs during 2005–2013, has been taken from the Examination Unit of Human Resource Development Group (HRDG) of CSIR. NET is conducted twice a year in June and December and the data from both the exams in each year are put together for the purpose of analysis.

The number of students appeared and the number of students selected for JRF-NET from SC/ST and General and OBC

Table 4. Subject-wise number of JRF awarded through NET to General/OBC and SC/ST candidates during 2005–2013

Subject	Chemical sciences		Earth sciences		Life sciences		Mathematical sciences		Physical sciences		Engineering sciences	
Year	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST	Gen/ OBC	SC/ ST
2005	632	87	73	32	615	143	275	19	317	22		
	(88)	(12)	(70)	(30)	(81)	(19)	(94)	(6)	(94)	(6)		
2006	705	103	75	56	550	184	140	11	229	39		
	(87)	(13)	(57)	(43)	(75)	(25)	(93)	(7)	(85)	(15)		
2007	907	177	71	26	966	292	164	30	370	48		
	(84)	(16)	(73)	(27)	(77)	(23)	(85)	(15)	(89)	(11)		
2008	1564	212	96	49	1138	335	414	53	441	50		
	(88)	(12)	(66)	(34)	(77)	(23)	(89)	(11)	(90)	(10)		
2009	1364	205	239	123	1358	369	480	59	595	90		
	(87)	(13)	(66)	(34)	(79)	(21)	(89)	(11)	(87)	(13)		
2010	1795	245	187	78	1308	358	566	51	255	46		
	(88)	(12)	(71)	(29)	(79)	(21)	(92)	(8)	(85)	(15)		
2011	1598	215	254	113	1265	244	286	31	226	42		
	(88)	(12)	(69)	(31)	(84)	(16)	(90)	(10)	(84)	(16)		
2012*	1490	218	235	127	1120	160	420	43	618	115	360	62
	(87)	(13)	(65)	(35)	(88)	(12)	(91)	(9)	(84)	(16)	(85)	(15)
2013	1343	174	257	79	1259	209	314	29	375	66	689	138
	(89)	(11)	(76)	(24)	(86)	(14)	(92)	(8)	(85)	(15)	(83)	(17)
Overall relative percentage during the period 2005–2013	87	13	69	31	81	19	90	10	87	13	84	16

Figures in parentheses represent relative proportion. *NET in engineering sciences started in 2012.

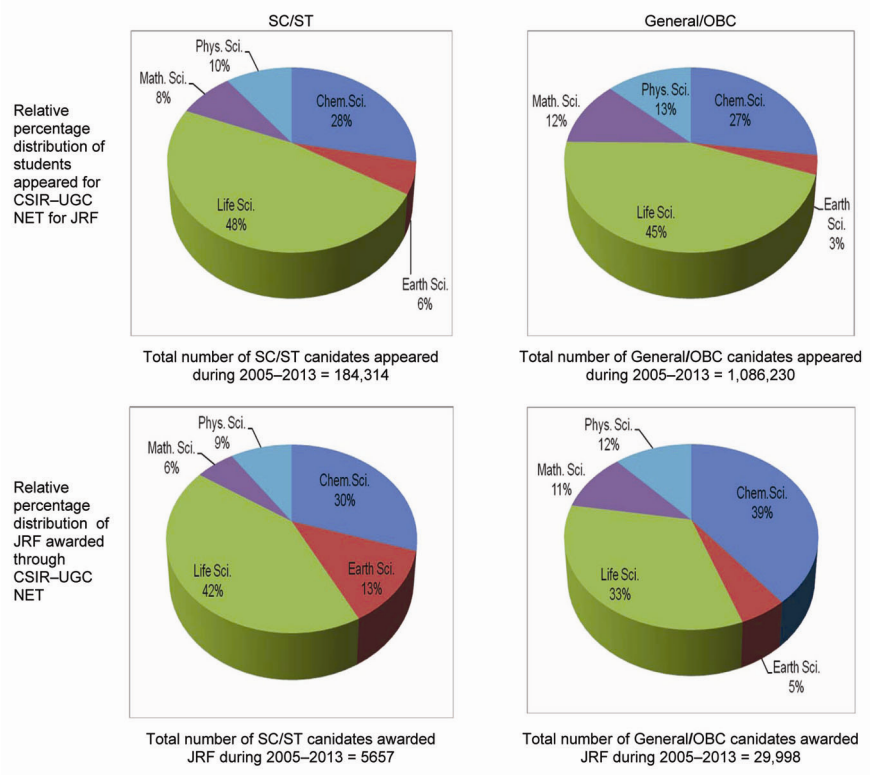

Figure 2. Subject-wise relative percentage distribution of candidates belonging to SC/ST and General/OBC category appeared for CSIR–UGC NET for JRF during 2005–2013 and of those selected for JRF under these categories.

category from 2005 to 2013 are shown in Figure 1. A growth of 180% in terms of the number of students that appeared in 2013 over 2005 has been observed in the case of students belonging to SC/ST category in comparison to 138% for students belonging to General and OBC category. The growth in terms of the number of JRFs awarded during the same period was also higher (129%) in case of SC/ST candidates in comparison to General and OBC candidates (122%).

Subject-wise analysis revealed that irrespective of the category, maximum students appeared for NET-JRF in the area of life sciences, followed by chemical sciences, physical sciences, mathematical sciences and earth sciences during the period 2005–2013. In the case of SC/ST candidates, maximum fellowships were awarded in the area of life sciences followed by chemical sciences, earth sciences, physical sciences and mathematical sciences. In the case of General and OBC category, maximum fellowships were awarded in the area of chemical sciences followed by life sciences, physical sciences, mathematical sciences and earth sciences (Figure 2).

Though there is a substantial increase in the number of students who appeared in all the subjects during 2005–2013, the relative proportion of SC/ST candidates in chemical sciences and life sciences was in the range of 13–16% during the period. In earth sciences, the relative proportion of SC/ST candidates ranged between 22% and 25%, whereas in mathematical sciences and physical sciences, it ranged between 7% and 12% (Table 3). Relative proportion of SC/ST candidates in engineering sciences was 15% (Table 3). The relative proportion of SC/ST candidates who were awarded JRF through NET in chemical sciences was in the range of 11–16% during 2005–2013. In earth sciences, the relative proportion of SC/ST candidates ranged between 24% and 43%, whereas in life sciences, it ranged between 13% and 25%. The relative proportion of SC/ST candidates in mathematical sciences and physical sciences ranged between 6% and 16% and in engineering sciences, it ranged between 15% and 17% (Table 4).

The overall relative percentage of SC/ST students who appeared in CSIR–UGC NET during 2005–2013 in chemical sciences, earth sciences, life sciences, mathematical sciences, physical sciences and engineering sciences was 15, 22, 15, 11, 12 and 15 respectively (Table 3). The overall relative percentage of SC/ST candidates in terms of the number of fellowships awarded in these subjects was 13, 31, 19, 10, 13 and 16 respectively (Table 4). The results indicated a parity in relative proportion of SC/ST candidates in selected and appeared candidates in the area of chemical, mathematical, physical and engineering sciences. In the area of earth and life sciences the relative proportion of selected candidates from SC/ST category was, however, higher in comparison to those who appeared in these two subjects.

Growth profile of SC/ST candidates, selected for JRF through CSIR–UGC NET during the period 2005–2013, indicates that the concerted efforts by the Government for the socio-economic development of under privileged through its various scholarship/fellowship schemes are bearing fruits, particularly in providing opportunities to SC/ST candidates to do doctoral research and thus to opt science and technology as a career.

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A mechanism of self-pollination in *Ajuga bracteosa* Wallich ex Benth

The movement of floral parts, including the pistil (style), stamen (filament, anther) and corolla has been observed in many angiosperms to affect successful pollination and mating. Various hypotheses have been proposed to explain the adaptive significance of floral movements[1–4]. It has been reported that styles exhibit curvature movements either to promote outcrossing[5,6], or to affect selfing, or to achieve delayed selfing[7–9]. In most of the cases the stigma, as the uppermost portion of pistil, is the seat of pollen reception[10]. Here, we describe a mechanism of self-pollination in *Ajuga bracteosa* Wallich ex Benth, (Lamiaceae), in which the bisexual flower bends its stigmas in such a way so as to come in contact with dehisced anthers without the aid of any external agency to ensure self-pollination.

The species is a perennial herb up to 15–40 cm long, stoloniferous; stems branched from base, grey villous or lanate-villous, especially on young parts; basal petioles 1–1.5 cm; basal leaf blade spatulate to oblanceolate, 2–4 × 0.7–1.2 cm; stem blades sessile or sub-sessile, obovate to subcircular, 1–1.5 × 0.6–1 cm, pilose or strigose, base cuneate–decurrent, margin inconspicuously to irregularly undulate–crenate, ciliate, apex obtuse to sub-rounded; basal verticillasters widely spaced, apical verticillasters in dense spikes; basal floral leaves densely lanate-villous, incised, ciliate; calyx campanulate, 4.5–6 mm, villous especially on teeth; teeth subulate–triangular, regular, 1/2 or more as long as calyx, apically acute, margin villous–ciliate; corolla purple or purplish with dark purple spots, tubular, slightly exerted, puberulent, yellowish glandular, villous annulate inside; upper lip straight, apex emarginate; middle lobe of lower lip obcordate, lateral lobes oblong (Figure 1 *a*).

The species produce pale blue to whitish flowers borne on crowded whorls; calyx with five nearly equal lobes, densely haired; corolla tube nearly twice as long as calyx, densely pubescent from outside, two-lipped with upper lip very short, two-lobed and lower lip three-lobed; stamens four, epipetalous, arranged in two rows (didynamous), upper row opposite to lower lip of corolla and lower row opposite to upper lip of corolla, filaments white and shining, anthers are dark brown, dehiscence longitudinal; carpels two, ovary superior, style gynobasic, stigma bifid (Figure 1 *b*).

A. bracteosa grows as wild in Afghanistan, Bhutan, China and Japan. The present study was carried out in Kashmir Himalaya, India, which represents the main valley of Kashmir together with the side valleys of Tilel, Guraiz, Keran and Karnah. The region falls within the biogeographic zone of the Northwestern Himalaya in India and lies between 33°20′–34°54′N lat. and 73°55′–75°35′E long., covering an area of 15,948 sq. km. The selected sites and their geo-coordinates are given in Table 1. The species grows in sloppy and landslide-prone areas with low moisture content in temperate to sub-alpine zones at an altitudinal gradient of 1620–2900 m asl.

In the bud stage of the flower, the style is short and stigma is close to anthers. As